FOUNDRY

EST. 1902 TRADE JOURNAL

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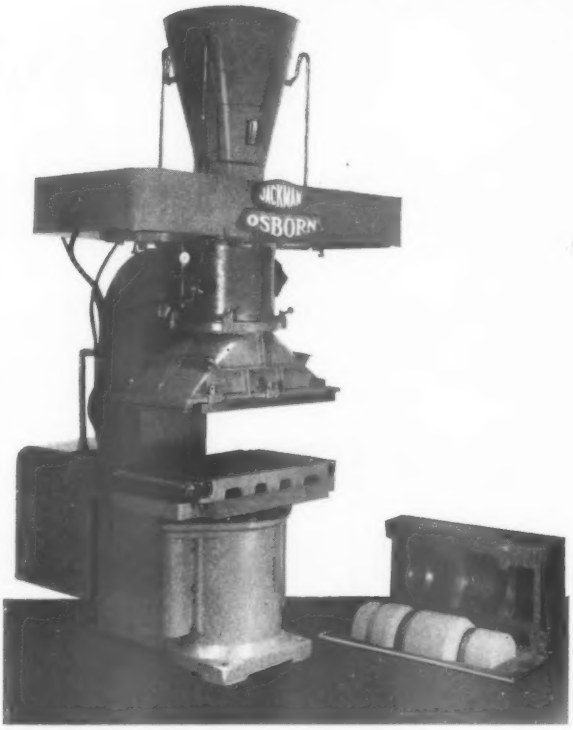

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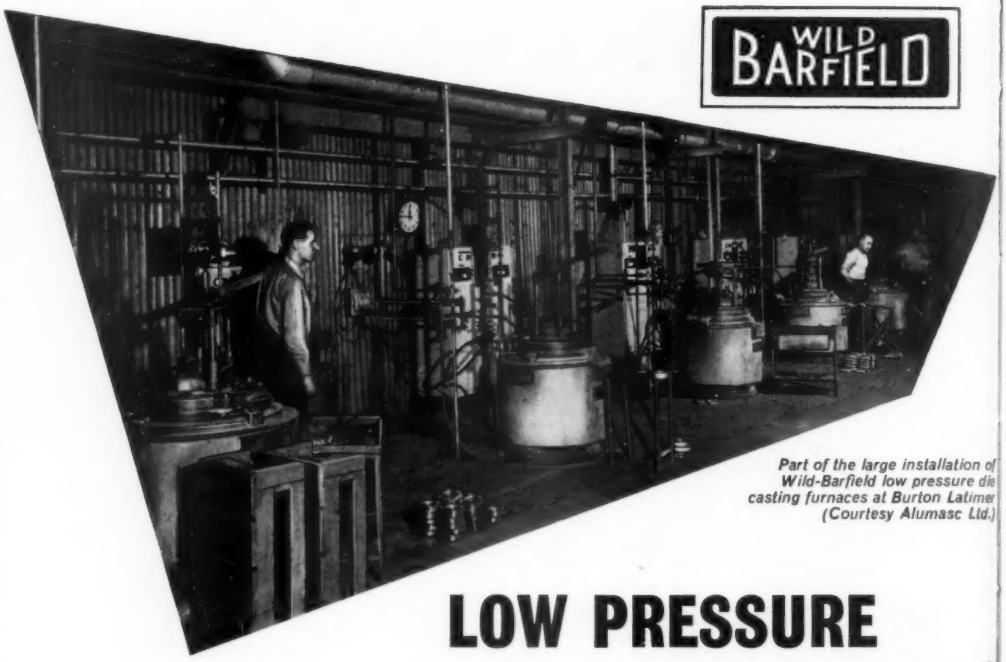

Part of the large installation of Wild-Barfield low pressure die casting furnaces at Burton Latimer (Courtesy Alumasc Ltd.)

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(Mains Frequency Induction Heated)

Simple to service
No elements to burn out
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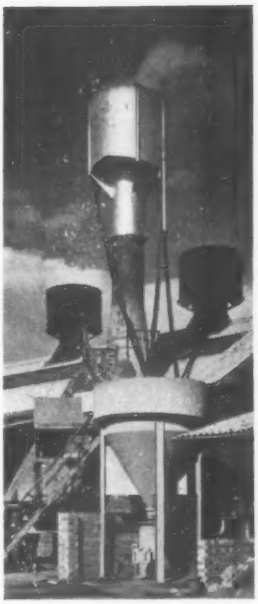

The Filter-Heat water screen grit and spark arrester was operating when the photograph was taken. As you can see against the background of blue sky only steam is escaping.

FILTER-HEAT LTD

(a subsidiary of Sutcliffe, Speakman & Co. Ltd.)

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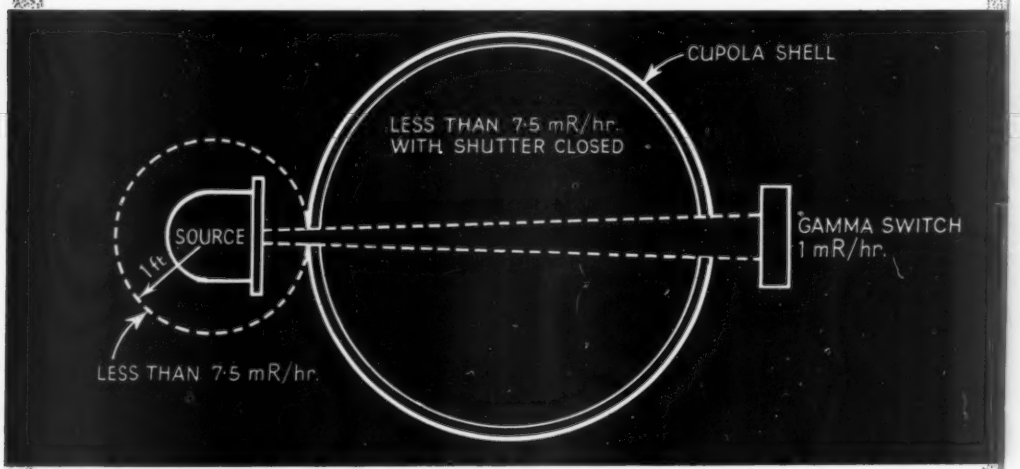
The Elliott-I.D.L. charge level indicator enables cupola charging systems to be operated automatically with complete safety. It provides certain and consistent results with minimum maintenance.



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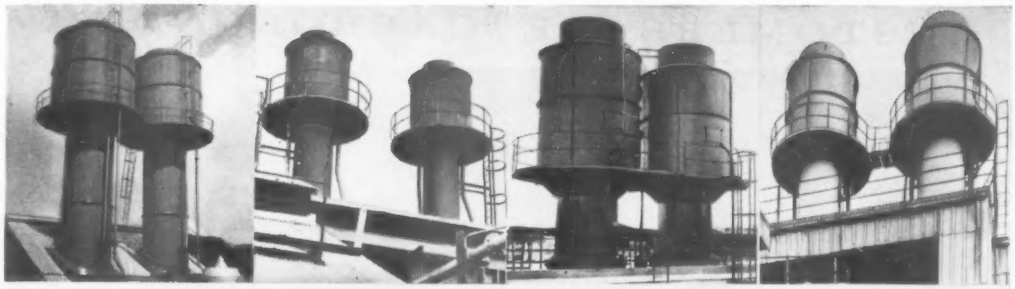

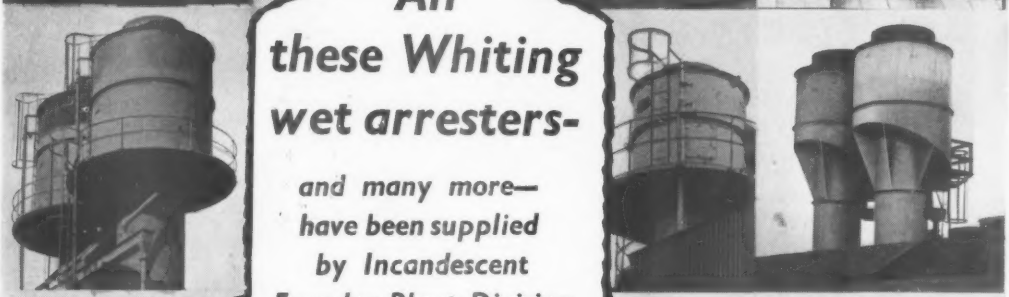

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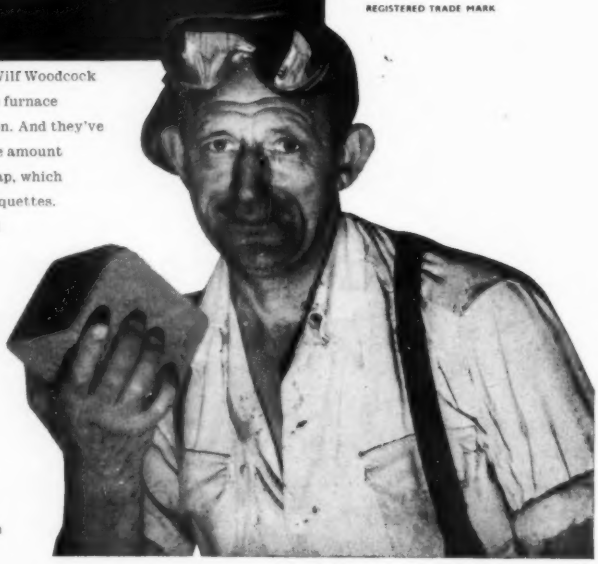

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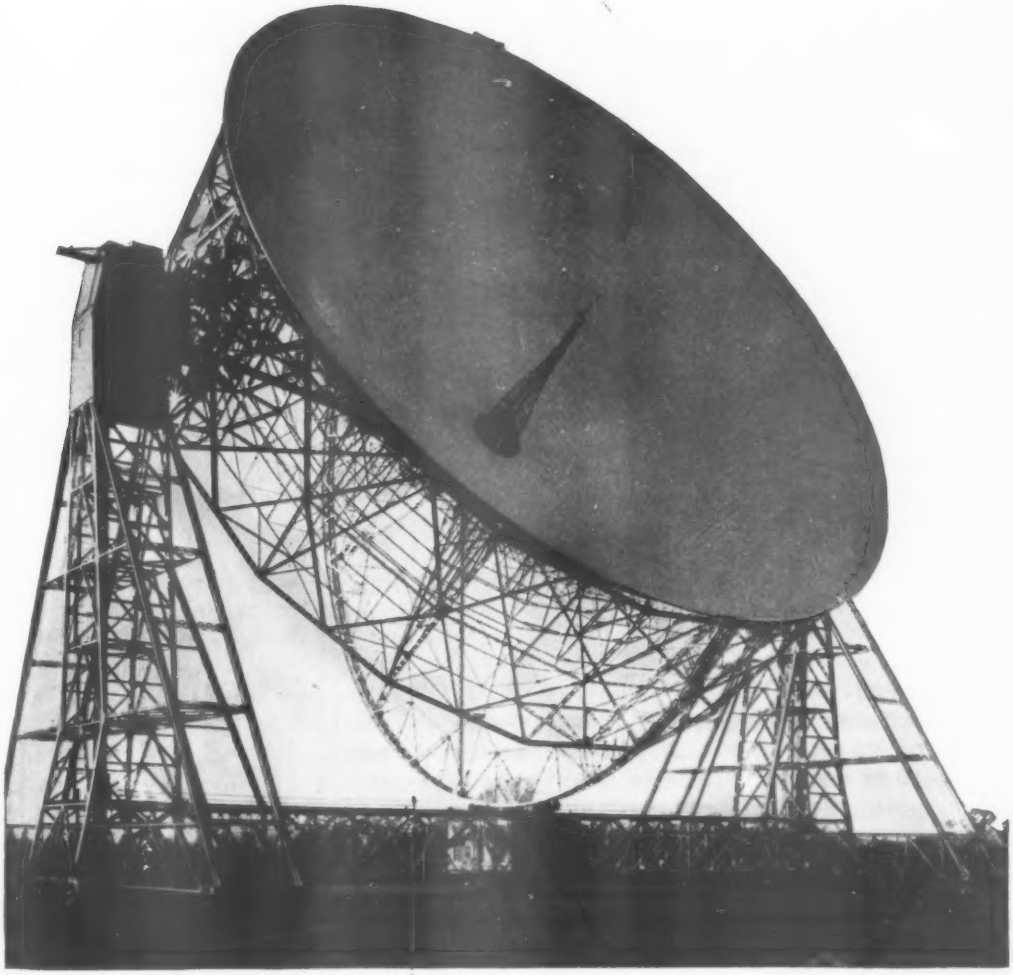

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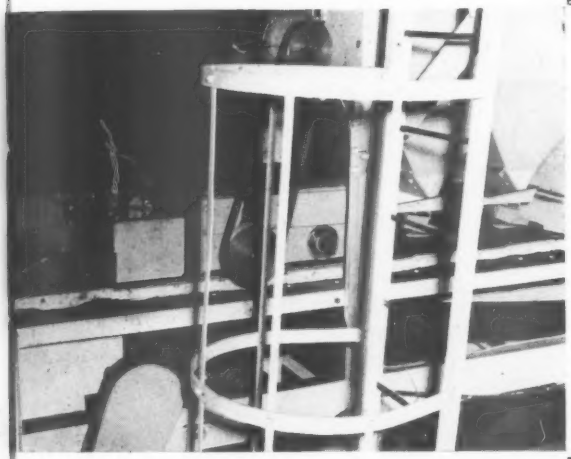
WORLD PATENT APPLICATIONS PENDING

General view of Con-Belt Mill handling 60 tons of sand per hour—fully mixed, mulled and aerated (this same Mill can be set for up to a maximum of 90 t.p.h.)—for grey iron.

MILL

e 60 t.p.h. Con-Belt Mill top mixing belt deck, ditions hoppers, 'first Disintegrator/Mixer and water dition' and two mixing and mulling belt decks, each h aerator unit.



Close up of top deck showing bond material and coal dust hoppers with vibratory feeders in front of main feeding and regulating hopper; first Disintegrator/Mixer and adjustable air pressurized atomizer for intensive distribution of moisture.

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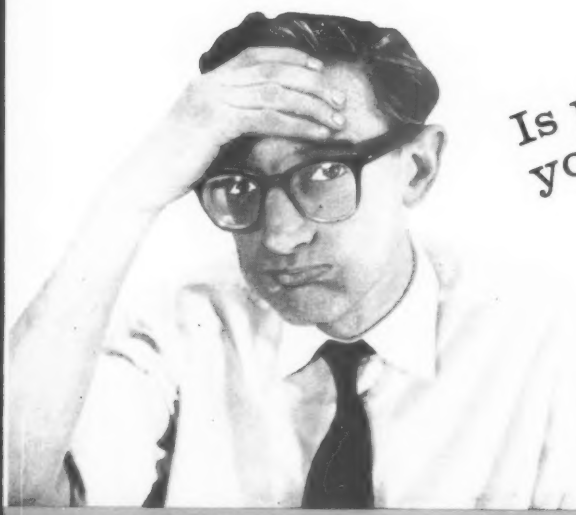

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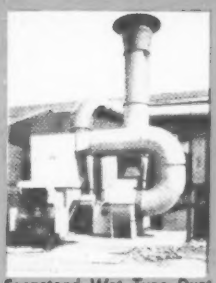
your droblem?

Mine was—and fume removal too, so I had a word with Spencer & Halstead. They examined the problem and installed one of their Spenstead Wet Type Dust Arresters. Presto the problem was solved.



Spenstead Wet Type Dust Arrester.

SPENSTEAD

For individual Dust Control Units or composite plant installation our advice is freely available. Remember we extract the DUST from inDUSTry.

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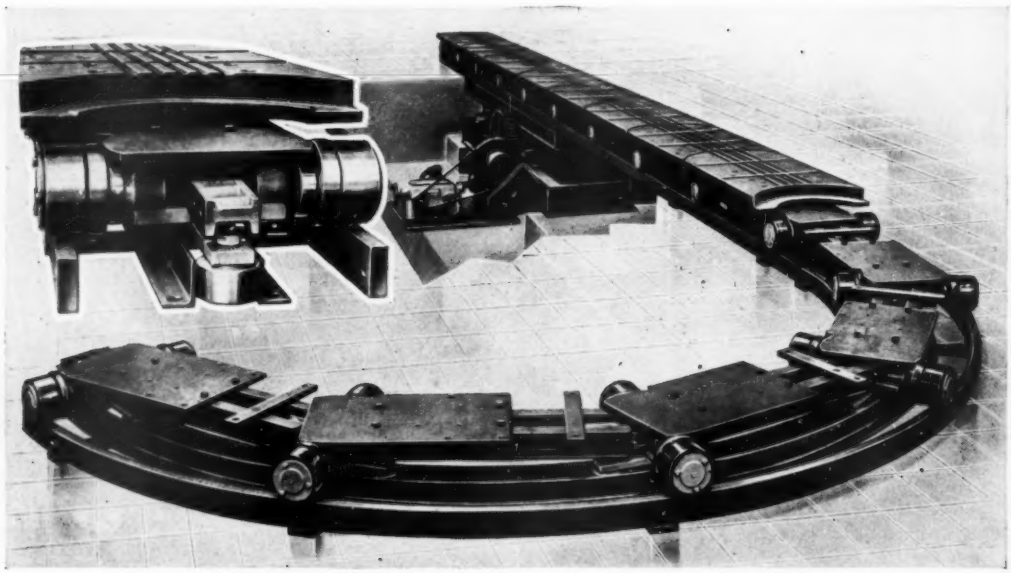
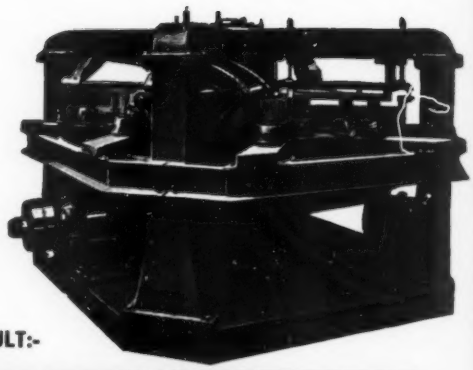


TYPICAL MOULD CONVEYOR SHOWING SOME C.I. PLATES REMOVED, ALSO DETAILS OF AXLES. SIZES TO REQUIREMENTS



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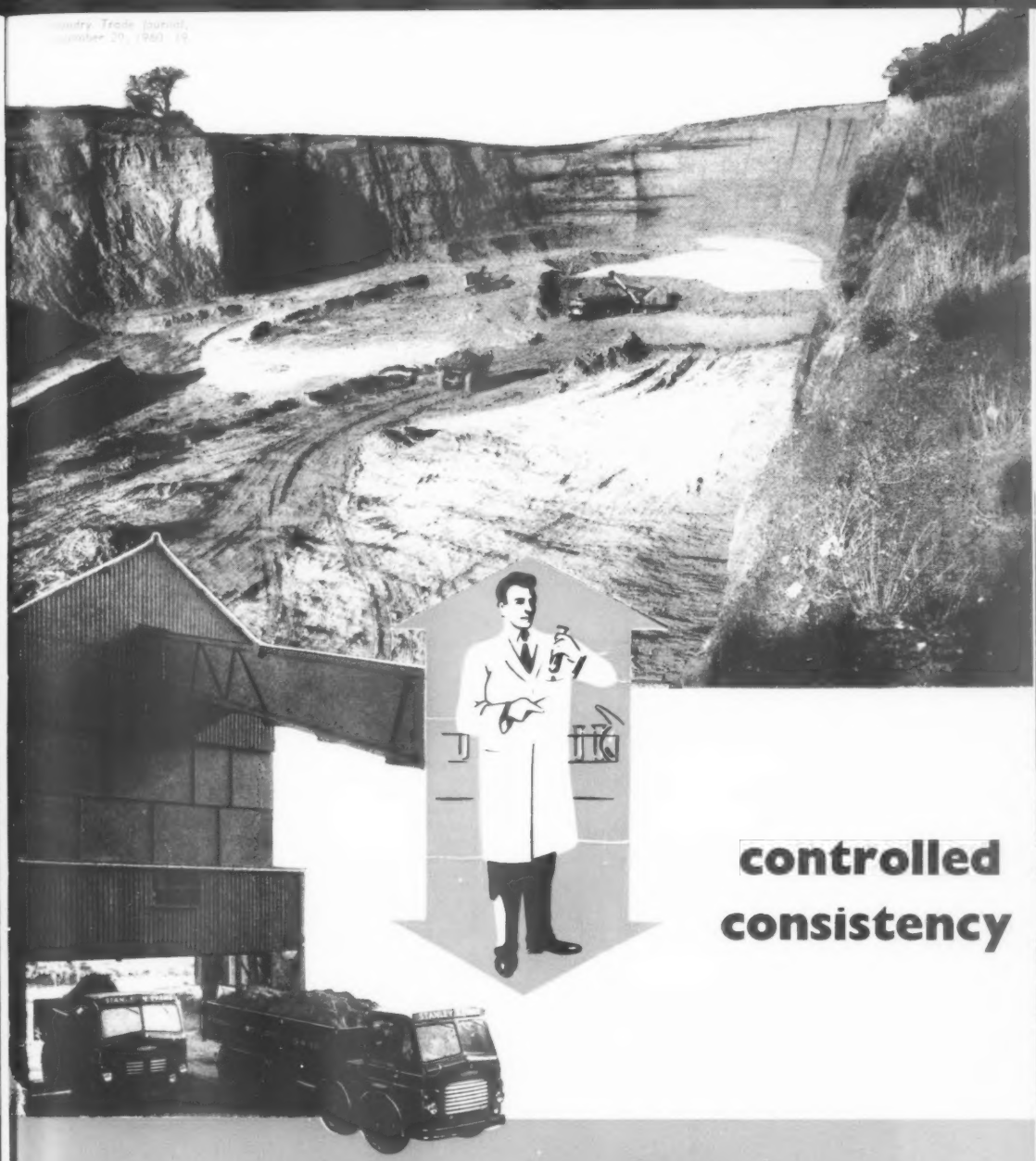

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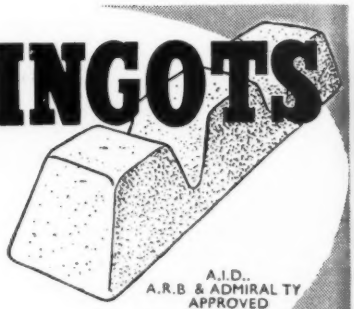

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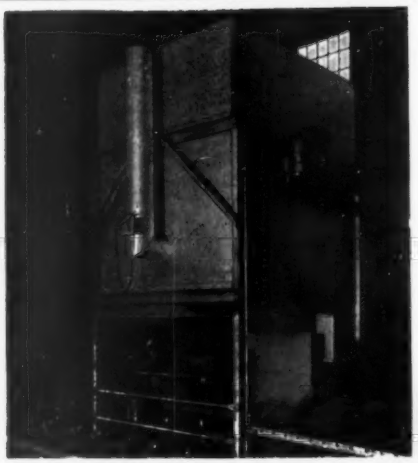

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Wheel hoods as developed by the British Cast Iron Research Association can be fitted.

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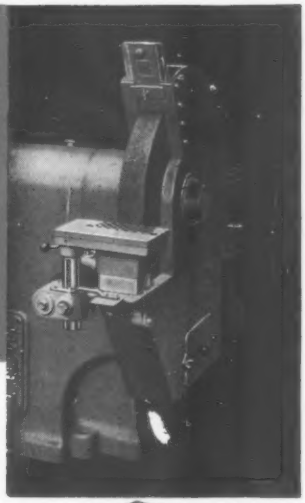

This 16 inch high speed swing frame grinder completely eliminates the dust problem. The dust is taken up at the point of suspension to ensure machine control and balance. It has been filmed in operation by the Factory Inspectorate and complies with all revelant regulations.

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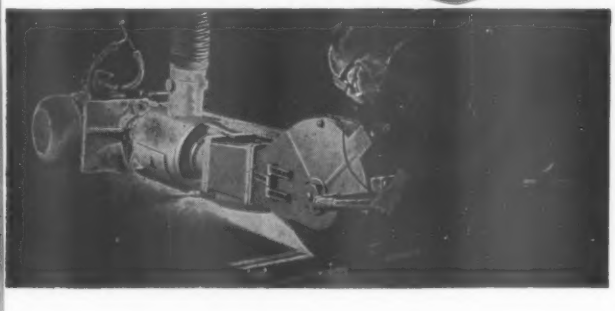

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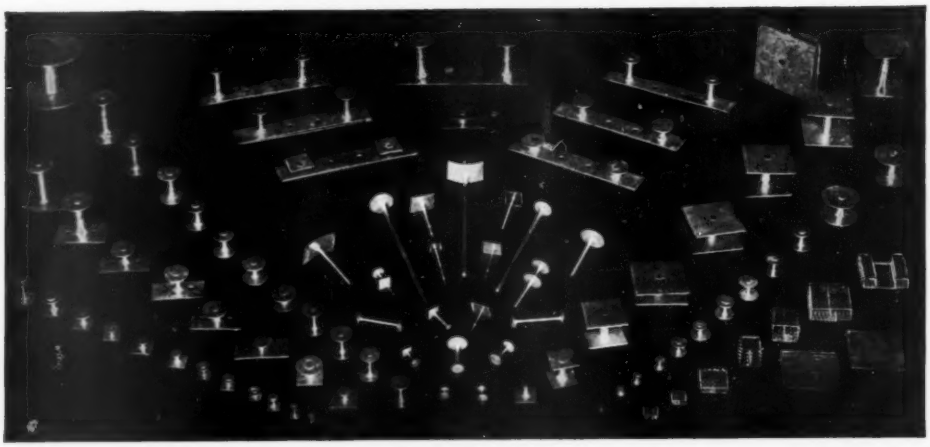

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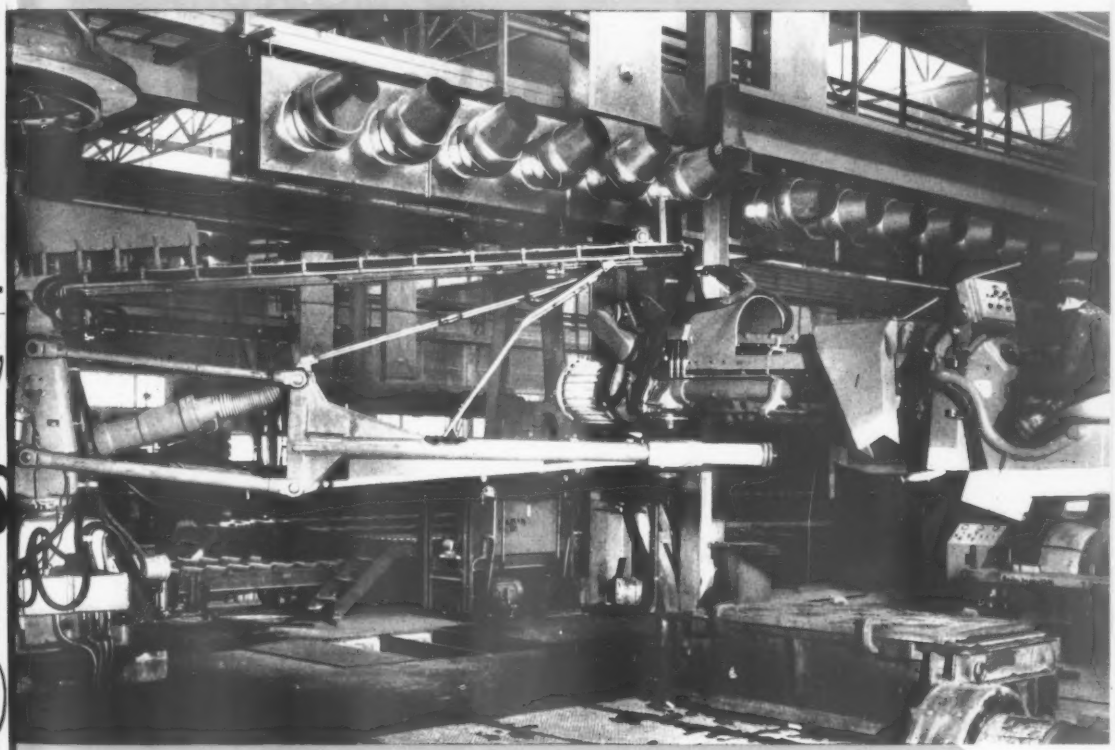

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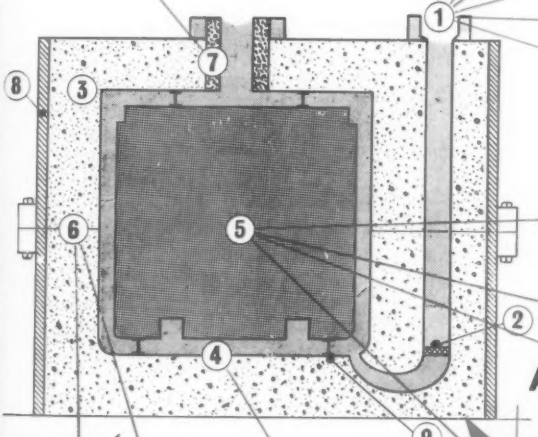

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3	Coal Dust additional to Facing and Backing Sand	1
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5	Cores using Crulin and Crudol Core Binders (Oil Bonded, Air Setting Cereal or CO_2 Binders).	2
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The foundry industry of the United Kingdom is represented by the following organizations, many of whose proceedings are regularly reported in this JOURNAL :—

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Scottish Laboratories: Blantyre Industrial Estate, Blantyre, Lanarkshire. 'Phone 486.

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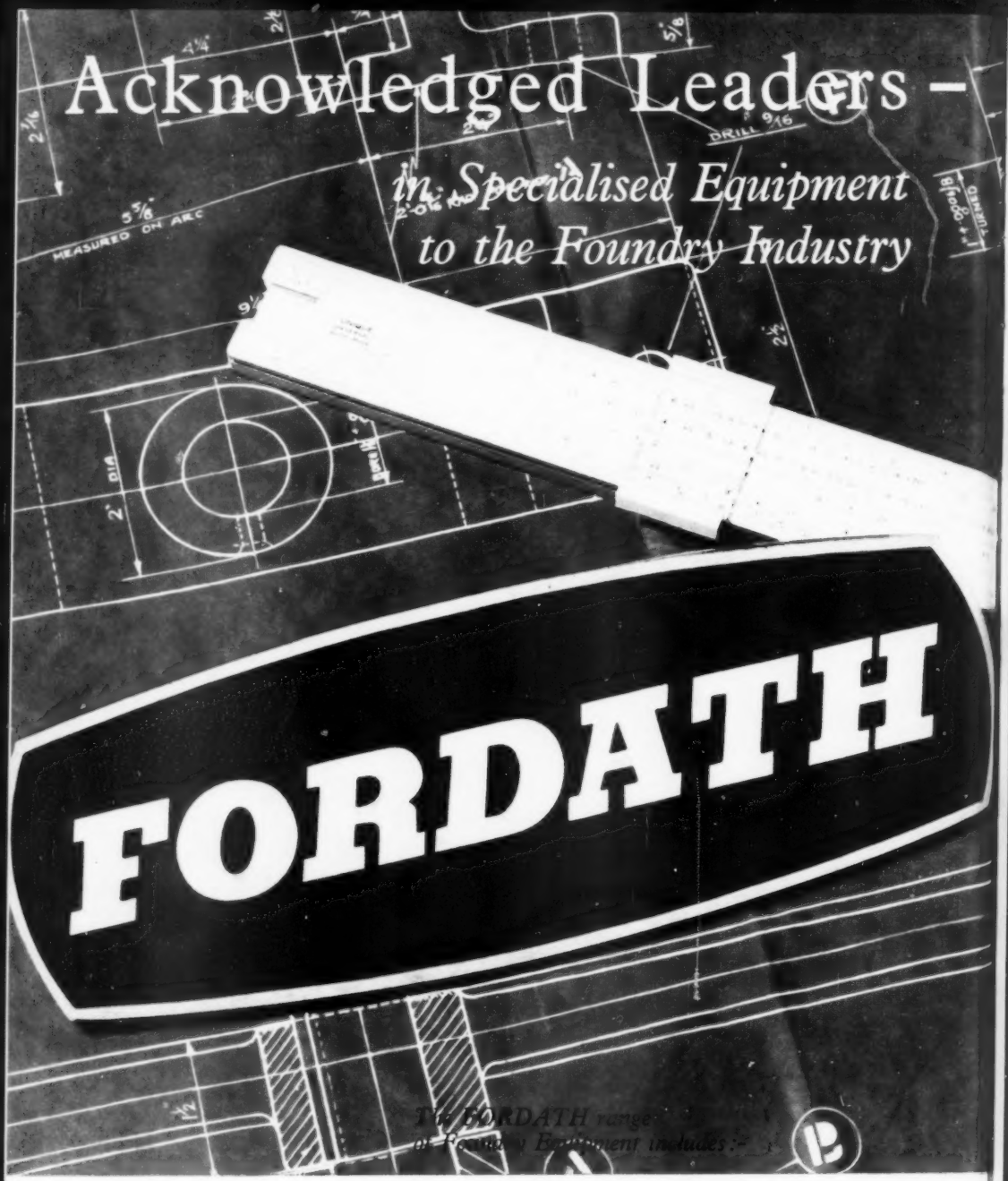

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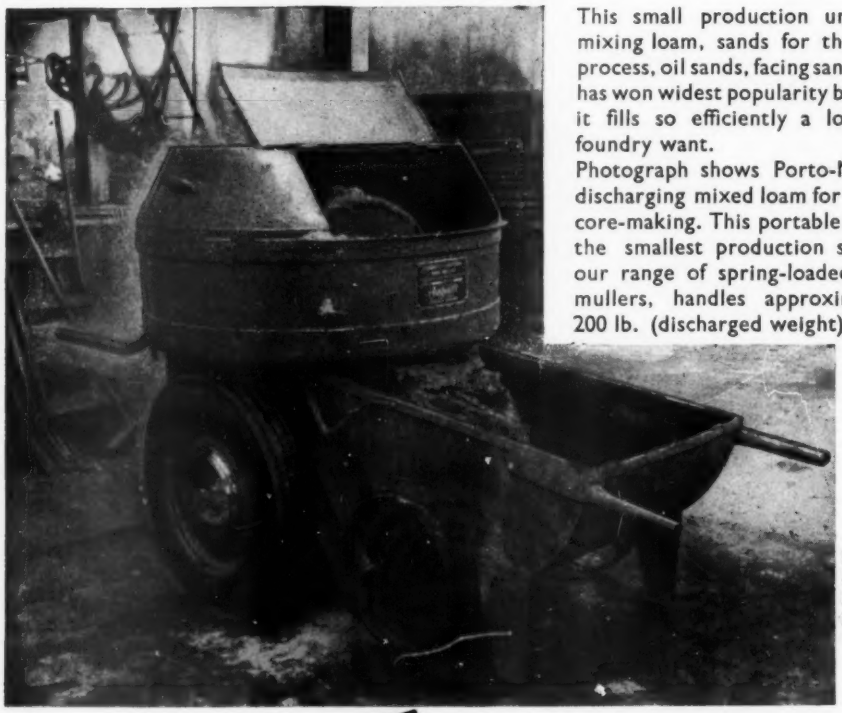

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FOUNDRY
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Vol. 109 December 29, 1960 No. 2299

1960 in Retrospect

So far as the foundry industry is concerned, on the whole, 1960 has been one of good trading conditions. For the last six months, however, optimism has been tempered by a fear of recession due to a slump in the automobile industry, which adversely affects both the ferrous and non-ferrous foundries. A notable feature in recent times has been the growth of die-casting foundries and precision castings in general. The newer processes, such as the CO_2 Process and shell-moulding, continue to expand, the latter being more pronounced for the production of cores. Mechanization is still bounding forward and this country is so advanced in this field that recently very large orders have been secured from abroad by the foundry equipment firms. Whilst not wishing to be pessimistic, it is as well to realize that export of manufacturing plant inevitably creates potential sources of competition for the home founders as suppliers of components for exportable machinery—just as the export of textile machines from Lancashire eventually resulted in loss of overseas markets for cotton goods.

Perhaps never has there been a year when the foundry industry was accorded such good publicity as in 1960. The International Foundry Apprentice Competition created widespread interest and was prominently featured in both the Press and on the air. Again, the banquet at Guildhall, graced by the presence of HRH Prince Philip, the Duke of Edinburgh, and organized by the Joint Iron Council, drew together a galaxy of people prominent in the affairs of State, science and industry. Thus it constituted a better and more lasting form of publicity to a more important public than could ever be created by daily-Press and radio announcements.

The technical side of the industry has been brought together by the holding of several international and national conferences—that in Zurich, for example, being outstanding for both its brilliant organization and social activities and the worth of the technical data disclosed. At the IBF conference at Malvern Mr. G. R. Shotton presided with distinction, combining a businesslike manner with a flair for selecting appropriate phraseology which marks the accomplished orator. With the growth of the Institute of British Foundrymen, the selection of towns with adequate accommodation for its conference participants becomes increasingly difficult and thought should be given to holding two meetings a year—perhaps a spring meeting in London and an autumn gathering either in the provinces or abroad. We are aware this would cut right across the activities of the International Committee of Foundry Technical Associations but it is still worth serious consideration. Among other conferences during the year notable for their technical value were those of the specialized type organized by the research and manufacturers' associations of the industry. It is at these that the " men from the foundry floor " can really get to grips with new problems that beset them in this rapidly changing foundry world.

Correspondence

To the Editor of the FOUNDRY TRADE JOURNAL

FALSE JOINTS IN MOULDING PRACTICE

SIR,—Well now, Mr. Williams, it's nice to hear from you and get your views on the above matter. In turn, you ask for mine, to which you're very welcome. The objective of the articles appearing from time to time in Craft Apprentices' Corner is to attempt to outline some of the basic techniques used in foundry practice, for the benefit of craft apprentices who may not always be familiar with them, and at the same time to encourage such apprentices to think for themselves about the application of these techniques.

I once heard it said that "there are roughly 2,000 foundries in the UK, which means that there are roughly 2,000 ways of making the same casting." Now this might be stretching it a bit, but the fact remains that different foundries *do* use different methods. After all, the business of a foundry is to produce good castings at an economical cost, and old "Tubal" reckons that any method which produces a good casting is a good method, but that does not necessarily mean that it's the only method, or the best or the easiest, or the quickest, or the cheapest. What it does mean is that if you continue long enough with a particular method you are in danger of developing a one-track-mindedness about it, very often to the point of refusing even to consider an alternative method.

There are a number of factors which can influence the adoption of a suitable method for a particular casting—so much depends upon the type of casting, the number off, the equipment available, the overall cost, and so on. Old "Tubal" reckons that if you are satisfied with the method you are using and it suits your own foundry practice, well, go right ahead and use it, but always make allowance for the fact that the fellow in the foundry next door may know a better way. If he *does* know a better way then it's odds-on he discovered it by *thinking* about it (that is, by adapting basic principles to suit particular needs). And if, as is evident from your correspondence, the article in question has set *you* thinking, then old "Tubal" is satisfied that it has, at least in some part, served its purpose.—Yours, etc.

"TUBAL CAIN."

Forty Years Ago

The JOURNAL of December, 1920, is noteworthy as it carried an article by Dr. G. H. Clamer giving the first description of the Ajax-Wyatt induction furnace. It was among the first electric furnaces to be successful for melting brass and bronze. (Dr. Clamer is known to be still active in American foundry circles.) The names of two foundry concerns were included among new companies registered—the Northampton Foundry Company, Limited, and David McDonald & Son, Limited. (As, in 1921, publication of the JOURNAL changed from a monthly to a weekly event, in future this feature will deal with a summary of the four or five weeks of any given month.)

Bolton College Foundry Course

Bolton Technical College reports that the first year of its course in foundry techniques and technology leading to the College diploma, is running to full capacity and is receiving the support of industry. Satisfaction with the course, the syllabus of which, more or less, follows that approved by the education committee of the Institute of British Foundrymen, has been expressed by H.M. Inspector of Education.

NSMP Notes

The latest *Bulletin* issued by the National Society of Master Patternmakers includes the following information among information supplied to members:—

Meetings:

During March, 1961, a general meeting will be held in Glasgow, to which all master patternmakers in the area will be invited, with the hope that they will become interested in the Society's aims and achievements. The support of all members who may be able to attend will be warmly welcomed.

The recent lecture given in London on the "Shaw Process" was well attended by members from London and the Midlands. The subject aroused considerable interest and lively questions followed Mr. Shaw's very lucid explanation of the process and its potential use in the patternmaking industry. In view of the interest shown in and response to requests from members not able to attend, it is hoped to arrange for a repeat of the lecture in Birmingham early in the New Year, and also to circularize to all members a copy of Mr. Shaw's paper.

An advance notice is given of the Society's annual general meeting and dinner/dance (1961); this function will be held on Saturday, June 3, at the Waldorf Hotel, Aldwych, London, W.C.2. It will be necessary for members to make their own arrangements for hotel accommodation, and they are urged to make reservations as soon as possible. At this function, the Society will have the visiting Italian master patternmakers as its guests.

New Members:

A welcome has been extended to new members: Laws & Son (Staines), Limited, Langley Road Works, Staines, Middlesex; Lindley-Potterton, Limited, Twycross Street, Leicester; Leonard Hall (Patterns), Limited, 85, William Street, Sheffield, 10; and the Sunderland Pattern Company, Limited, 3, Peacock Street West, Sunderland.

Forthcoming Events

JANUARY 3

Institute of British Foundrymen

Coventry section: "Effects of Technical Changes on Manpower Requirements," 7.30 p.m., in the Lecture Theatre of the Herbert Art Gallery and Museum.

JANUARY 4

Institution of Plant Engineers

Edinburgh branch: "Heating," by A. A. Kidd, 7 p.m., at 25, Charlotte Square.

Southern branch: Members' discussion on "My Job," 7.30 p.m., at the Polygon Hotel, Southampton.

Leeds Metallurgical Society

"Some Recent Developments in the Welding of Metals," by E. N. Gregory, 6 p.m., at the University Staff House, University Road, Leeds.

JANUARY 5

Institute of Metals

Birmingham local section: "Vacuum Technology," by T. Thorley, 6.30 p.m., at the College of Technology, Gosta Green, Birmingham.

London local section: "Metallurgy in Electronics," by J. E. Hughes, 6.30 p.m., at 17, Belgrave Square.

LANCASHIRE DYNAMO & CRYPTO, LIMITED, a company in the Metal Industries group, has received an order from Fairey Engineering, Limited, sub-contracting to Atomic Power Construction, Limited, for nearly 400 permanent-magnet motors for operating the reactor control rods of the Trawsfynydd nuclear power-station.

Calculation of Casting Weights

*By M. Callaghan**

It is necessary to assess the weights of castings for a number of purposes in the foundry. The accuracy required depends upon the nature of this purpose, which may be in connection with handling, transport, ladle and melting capacity, or crane-loading capacity. However, probably the most important demand for weights is related to the costs for the estimates on which selling prices are based. Foundries operating processes adapted to intricate or precision castings, base their prices on other factors, but the greatest number faces the weight-calculating problem, and will find this article of interest.

Although it is important to estimate accurately for costing purposes, the man who expects to be always within one per cent. of the actual weight is expecting too much of himself, or his staff. However, it should always be possible to be within four per cent. and any error over this figure should be investigated.

Sources of Error

(*a*) Every section-thickness of a casting tends to increase because patternmakers often leave a little extra metal behind the flanges; section thicknesses made by cores are less precise; and the machining allowance on heavy work is often more than stated. Also, the patternmaker's experience of the requirements of the moulder may result in his allowing too much taper. Another cause of error, beyond the estimator's direct control, arises by the coremaker rapping boxes too much, especially if the core is tight, due to a sticky coremix, no taper, and burrs or roughness on the rubbing-faces of the corebox. The moulder, too, often creates a source of error by sleeking the mould and cutting large fillets where none, or few, are required.

To reduce these errors, the estimator should discuss with the production-staff practical measures to keep "growth" of the section-thickness to a minimum. Many moulders will be surprised to learn that making 100 ft. only of 1½-in. fillet in a large mould will add 1½ cwt. to the weight of a steel casting—and a casting need not be so very large to have 100 ft. of fillet. It is necessary, therefore, for an overweight allowance to be added to many weight calculations, the amount depending upon experience, but kept to a minimum with the co-operation of the men concerned.

(*b*) Another cause of error may arise from the use of wrong values in density and specific-gravity tables. It is well to remember that quoted figures are *average* values only. They can be depended upon for general use, but foundries which produce a proprietary metal should have a sample weighed accurately and the data recorded.

(*c*) Never guess the weight of a casting *before* setting about the calculation, but make the mental comparison *after* completing it. The reason for this is that psychologically there is a tendency to work towards the figure which has been guessed, sometimes leading one to cancel out correct working because it does not conform. It is necessary, too, mentally to check the accuracy of each step in the calculation *after* the result has been determined by the application of a formula.

(*d*) Finally, care should be taken with approximations. Making 0.28 into 0.3 for ease of calculation may seem very little, but an error of 7 per cent. is being introduced which, in some cases, may be considerable. When approximating with small quantities, use the "tit for tat" system so that 0.28 by 0.83 could be made 0.3 by 0.8 with very little harm being done.

Estimating Methods

There are three methods by which a weight estimate can be made, two requiring the pattern and the third the drawing only.

(1) *By ratio*

If the pattern is available, this method is the simplest, but the following exacting conditions apply. (1) The casting has to be without cores; (2) the pattern should be solid; (3) it must be made substantially from the same timber, and (4) it should not have any metal fittings, such as rapping plates or dowel plates—commonsense should be applied here, as when these items are small, they will give rise to only small errors.

TABLE 1.—*Ratios between Pattern Material and Casting Material.*

Pattern material.	Casting material.				
Type of timber.	Gun-metal.	Brass.	Cast steel.	Cast iron.	Alu-minium.
White pine	18.0	17.5	16.0	14.5	5.5
Yellow pine	17.0	16.5	15.0	14.0	5.0
Cedar	13.0	12.5	12.0	11.0	3.7
Mahogany	10.0	9.5	9.0	8.0	3.0

The figures in Table 1 represent the number of times the weight of the pattern should be multiplied to give the equivalent weight of the corresponding metal casting. For example, a yellow-pine pattern which complies with the conditions hitherto stated, and weighing 15 lb., will enable a casting to be produced in brass, which should weigh: 16.5 by 15, or 16.5 by 5 by 3, or 82.5 by 3, or 247.5 lb. as a casting. (Note: It is sometimes

* The Author is teacher of patternmaking and foundry practice at the David Dale College, Glasgow.

Calculation of Casting Weights

possible, as in this case, to use the factors of a number in order to calculate mentally.)

(2) *By displacement*

For this method, the pattern must be available, but the conditions imposed by method No. 1 (by ratio) do not arise in this case. A body will displace its own volume when immersed in water, so that if a tank is available, the procedure is as

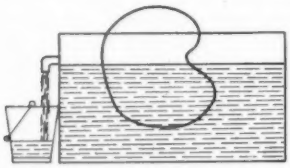


Fig. 1.

follows:—Fill the tank to the point of overflowing, then gently immerse the pattern into it. The overflow is then measured (Fig. 1). If no overflow is fitted to the tank, then the rise in the level of the water may be used as a basis for calculation (Fig. 2). A well-painted pattern will not come to any harm by a single immersion in water and the time and work saved may be great, whilst the volume assessment is very accurate.

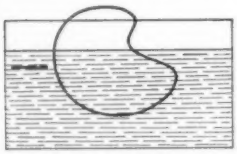


Fig. 2.

TABLE 2.—*Densities of Metals.*

Metal.	Lb. per cub. in.	Lb. per cub. ft.
Gunmetal	0.31	535
Brass	0.29	500
Steel	0.28	485
Iron	0.26	450
Aluminium	0.092	160

Cast iron is commonly calculated as four cub. in. to one lb. to make for ease of calculation. This figure will be almost correct if the metal is soft-grey iron, but normally a four per cent. error is introduced by using this value as compared with that given in Table 2. This error of four per cent. under can, however, be added to the final estimated figure to bring it nearer the actual. As an example of this method of calculation (by displacement), the following can be considered. An intricately-shaped pattern is available to produce an iron casting. This pattern is immersed slowly into a tank of water, the overflow being caught in a 2-gall. bucket, and the pattern held still when the bucket becomes full to allow the water to be tipped out. If 4½ buckets of water are displaced this would thus amount to 9 gall. One gall. of water occupies 0.16 cu. ft., therefore 9 gall. occupies 0.16 by 9, *i.e.*, 1.44 cu. ft. As the density of cast iron is 450 lb. per cu. ft. (see Table 2), the weight of the casting will be 1.44 by 450 or 648 lb. (5 cwt. 88 lb.).

The next example is worked in conjunction with Fig. 2. Here it is assumed that (1) no overflow is provided on the tank; (2) that the casting has cores; and (3) that the density of cast iron is taken as 4 cub. in. per 1 lb. The procedure is as follows: A chalk mark is made on the inside of the tank at the water level, and the pattern is immersed slowly, a further chalk mark being made on the side of the tank above the original mark, when the pattern is below the water line. If the tank measures 5-ft. long and 4-ft. wide and the water level rises by $\frac{7}{8}$ in. when the pattern is completely immersed, then the volume displaced (in cu. in.) would be $\frac{60 \text{ by } 48 \text{ by } 7}{8} = 2{,}520$ cu. in. If the corebox is of simple proportions, its volume may be calculated and subtracted from above. If, however, the corebox, too, is intricately shaped, then it should be loosely filled with dry natural-sand, the contents poured into a box or frame, of very

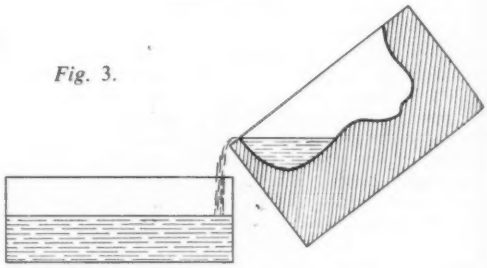


Fig. 3.

simple proportions, and the sand surface made level—the depth of the sand is then simply measured (see Fig. 3). The frame in Fig. 3 is 2-ft. square and the sand 1½-in. deep. The volume of the core would be then. $\frac{24 \text{ by } 24 \text{ by } 3}{2} = 864$ cu. in. To calculate the volume of the casting, the volume of the core is deducted from the volume of the pattern, *viz.*, 2,520 − 864 = 1,656 cu. in. Its approximate weight will therefore be, $\frac{1{,}656}{4} = 414$ lb. As 4 cu. in. to the 1 lb. is 4 per cent. below, the error is $\frac{4}{100}$ by $414 = 4 \times 4.14 = 16.56$ lb. The estimated weight of the casting is therefore $414 + 16.56 = 430.56$ lb., or 431 lb. to the nearest whole number.

Possible errors can be eliminated in assessment of the volume of a core if the measuring frame has approximately the same top surface dimensions as the corebox, or if a smaller tip-out frame is used, it should be the same average-depth as the corebox. These conditions will maintain a sand pressure in the frame similar to that in the corebox, so that loss of volume due to compression of sand will be reduced to a minimum.

(3) *Calculated volume*

This method (by calculated volume) is most common where the pattern is not available, and the estimate has to be made from the drawing. The process can be a complicated one, and many formulæ may need to be dealt with. As a result, the Author will attempt to suggest a method of simplifying the work, whilst maintaining a maximum level of accuracy.

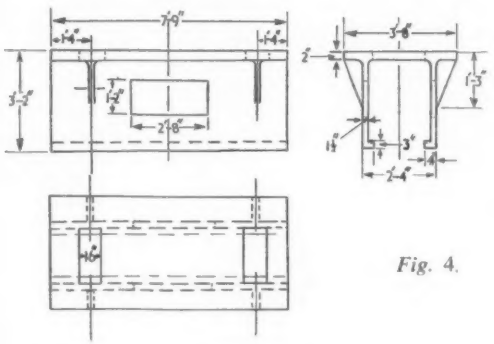


Fig. 4.

Referring to the sketch of the cast-steel bedplate in Fig. 4, the first step to be taken in this method of calculation is to divide the end view into plates and mark out sketches of the cut-out portions (Fig. 5).

Tabulate overall dimensions:—

Solid sections (feet).

Piece.	Length.	Breadth.	Thickness.	No. off.
(*a*)	$7\frac{3}{4}$	$3\frac{5}{8}$	$\frac{1}{4}$	1
(*b*)	$7\frac{3}{4}$	3	$\frac{1}{4}$	2
(*c*)	$7\frac{1}{4}$	$\frac{1}{4}$	$\frac{5}{16}$	2
(*d*)	$1\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$	2

Calculate:—

$$(a)\ \frac{31 \times 11}{4 \text{ by } 3 \text{ by } 6} = \frac{341}{72} = 4{\cdot}740$$

$$(b)\ \frac{31 \text{ by } 3 \text{ by } 2}{4 \text{ by } 8} = \frac{93}{16} = 5{\cdot}820$$

$$(c)\ \frac{31 \text{ by } 5 \text{ by } 2}{4 \text{ by } 4 \text{ by } 24} = \frac{155}{192} = 0{\cdot}810$$

$$(d)\ \frac{13 \text{ by } 2 \text{ by } 2}{12 \text{ by } 3 \text{ by } 8} = \frac{26}{144} = 0{\cdot}181$$

Total: 11·551 cub. ft.

Cub. ft.

Tabulate cut-out portions:—

Windows (feet).

Piece.	Length.	Breadth.	Thickness.	No. off.
(*e*)	$\frac{13}{16}$	$\frac{19}{32}$	$\frac{1}{4}$	2
(*f*)	$2\frac{1}{8}$	$1\frac{1}{8}$	$\frac{1}{4}$	2

Calculate:—

$$(e)\ \frac{25 \text{ by } 10 \text{ by } 2}{24 \text{ by } 12 \text{ by } 6} = \frac{250}{864} = 0{\cdot}289 \text{ cub. ft.}$$

$$(f)\ \frac{8 \text{ by } 7 \text{ by } 2}{3 \text{ by } 6 \text{ by } 8} = \frac{7}{9} = 0{\cdot}777 \text{ cub. ft.}$$

Total: 1·066 cub. ft.

Volume of plates:—

11·551 − 1·066 = 10·485 cub. ft.

In this method of calculation, the next consideration is the fillets, the lengths of which are:— (4 by $7\frac{3}{4}$) + (2 by $7\frac{1}{4}$) + (8 by 1) + (8 by $\frac{3}{4}$) *i.e.*, 29 + 15 + 8 + 6, or, 58 ft. of fillets. However, the weight per ft. of common sizes can be taken from Table 3.

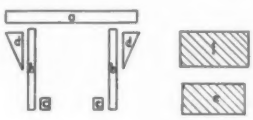
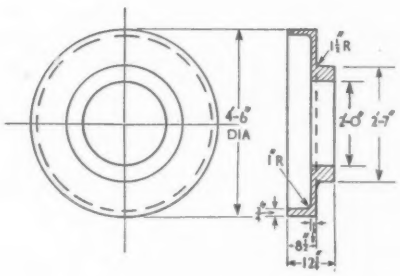


Fig. 5 (*left*).

Fig. 6 (*below*).



General formula for area of fillet:—
$R^2 - 0.7855\ R^2$

TABLE 3.—*Weight of Fillet in lb. per ft.*

Size. R	Gun-metal.	Brass.	Cast steel.	Cast iron.	Alu-minium.
¼ in.	0.193	0.182	0.175	0.161	0.058
1 in	0.8	0.75	0.705	0.67	0.238
1½ in.	1.72	1.62	1.55	1.45	0.512
2 in.	3.25	3.05	2.95	2.75	0.97
2½ in.	5.0	4.65	4.5	4.16	1.48
3 in.	7.5	6.6	6.45	5.9	2.1

From Table 3, 1 ft. of 1½-in. fillet in steel = 1.55 lb. Therefore, the weight of 58 ft. is 1.55 × 58 = 90 lb. Volume of plates is 10.485 cu. ft. and the density of steel is 485 lb. per cu. ft. (see Table 2), and their weight being the product of these two is, 5,085 lb. The minimum weight of casting must

Calculation of Casting Weights

include the weight of fillets and will thus become, 5,175 lb. However, as a casting of this design will show a tendency to section growth, an allowance of three per cent. should be made, giving a final estimated weight of the casting as 5,330.25 lb.

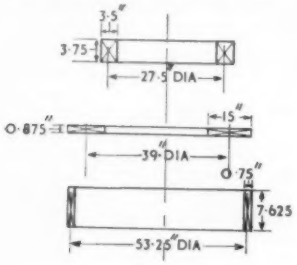


Fig. 7

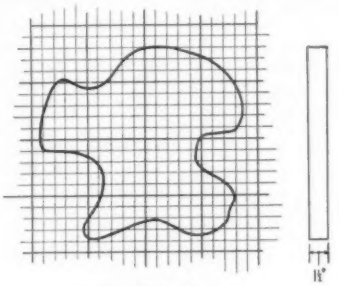


Fig. 8

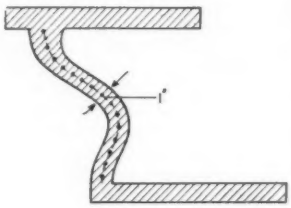


Fig. 9

Annular Castings

When dealing with annular castings (Fig. 6), these are divided up for ease of calculation into rings (Fig. 7). The quickest formula to use in annular work is derived from Guldinus' theorem where the volume of metal is found from the product of π by the mean diameter (MD) by the cross-sectional area (CSA), written thus:—π MD by CSA.

π is 3·142, and MD is, outside dia. + inside dia. / 2

The mean diameters for the three rings in Fig. 7 are calculated as follows:—

$$\text{(Top) MD} = \frac{\text{2 ft. 7 in.} + \text{2 ft.}}{2} = \text{2 ft. 3}\tfrac{1}{2}\text{ in.}$$

$$\text{(Centre) MD} = \frac{\text{4 ft. 6 in.} + \text{2 ft.}}{2} = \text{3 ft. 3 in.}$$

$$\text{(Bottom) MD} = \frac{\text{4 ft. 6 in.} + \text{4 ft. 4}\tfrac{1}{2}\text{ in.}}{2}$$

$$= \text{4 ft. 5}\tfrac{1}{4}\text{ in.}$$

Volume = π MD × CSA

(Top) Volume 3·142 × 27·5 × 3·5 × 3·75 = 1,130 cub. in.

(Centre) Volume 3·142 × 39 × 15 × 0·875 = 1,600 cub. in.

(Bottom) Volume 3·142 × 53·25 × 7·625 × 0·75 = 957 cub. in.

Total volume = 3,687 cub. in.

As weight = Volume by density

Weight of rings = 3,687 by 0·31 (see Table 2) = 1,143 lb.

To find the weight of the fillets, their lengths need to be known. These are, in this instance, circumferences of circles found by multiplying the diameter by π (written π D). The length of fillet round the outside of the boss is 3.142 by 31 = 97.5 in. Weight per foot of 1½-in. fillet is 1.72 lb. (see Table 3). Therefore, the weight of the fillet round the outside of the boss is $\frac{1.72 \times 97.5}{12}$, which is approximately 14 lb. Length of fillet round the inside of rim = 3.142 by 52.5 = 165 in. Weight per ft. of 1-in. fillet is 0.8 lb. (see Table 3). Therefore, the weight of fillet round the inside of the rim is $\frac{165 \text{ by } 0.8}{12}$ = 11 lb. Minimum weight of casting = 1,143 + 14 + 11 lb. = 1,168 lb. In this instance the section thickness is likely to increase on the inside of the rim so an increase of two per cent. should be added to the weight of the casting, giving a final estimated weight of approximately 1,192 lb.

Estimation of Irregular Shapes

Method 1: Squared paper

The simplest method of finding the area of large irregular shapes is by using squared paper. These paper "templates" can be made by using a piece of ordinary tracing paper, which should measure standard imperial-size of 22 by 30 in. On each sheet is drawn a series of 1-in. squares to convenient scales, *e.g.*, 6 in. to 1 ft., 4 in. to 1 ft., etc. For estimating areas, the appropriate sheet of squared-up tracing paper is selected (*i.e.*, squares of the same scale as the scale used in the drawing), and this is then laid over the drawing. The area is calculated by counting the number of squares inside the boundary of the figure. The counting can be reduced by the use of heavier lines which block off a large group of squares, *i.e.*, 10 by 10, 5 by 5, etc. (see Fig. 8). The possible error here lies in the accuracy of the scale used in both the drawing and the squared paper, and, therefore, the overall sizes of the scale of the drawing should be checked before progressing, although this is usually found to be correct. Taking Fig. 8 as an example, the volume of this is 234 by 1½ = 351 cu. in.

Method 2: Stepping-off

If a casting is parallel in section although the profile changes, the mean length may be found by stepping-off the scaled (1½ in. to 1 ft.) sketch with dividers (see Fig. 9). The series of dots along the centre-line indicates the distances marked out by the dividers. For example, if the compass was set to ⅛ in. and stepped off 11 times, the mean length would be $\frac{1 \text{ by } 11 \text{ by } 12}{8 \text{ by } 1.5}$ = 11 in. Area = 11 by 1,

i.e., 11 sq. in. The area of the flanges would be estimated as already described.

Application of methods 1 and 2

When surfaces are irregular in two directions, a combination of the previous principles is used (see Fig. 10). Referring to Fig. 8, the volume is found in four steps, *viz.* (1) Squared paper to the appropriate scale is laid over the front elevation and the area found as in method 1. (For this example, the area may be found to be 783 sq. in.) (2) The mean length of the section in the end-elevation is

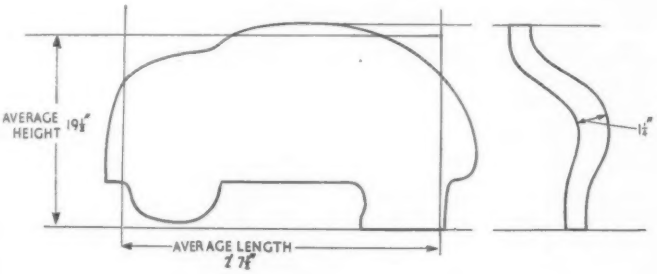


Fig. 10 (*above*).

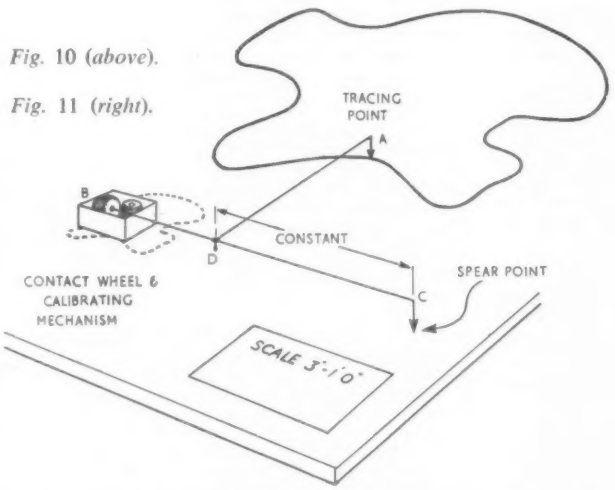


Fig. 11 (*right*).

found (as described in method 2), and let us say this is 23 in. (3) Subtract the average height of the front elevation from 23½, *i.e.*, 23½ − 19½ = 4 in. and multiply this by the average length of 2 ft. 7½ in., *i.e.*, 31½ by 4, giving 126 sq. in. (4) Add the results of (1) and (3) (783+126=909 sq. in.) and multiply by the thickness (1.25 in.) to find the volume. Hence, volume is 1.25 by 909, *i.e.*, 1,136.25 cu. in. The minimum weight of casting thus becomes 1,136.25 by 0.26 (from Table 2), making 295.42 lb.

Little "growth" is likely in this instance as the average dimensions should be a little on the liberal side, so that the minimum weight could be taken as the estimated weight also.

Method 3: Planimeter

The planimeter is an instrument used for measuring the areas of irregular surfaces or sections (see Fig. 11). The instrument has two arms pivoting at D with a calibrating mechanism, and a rotating contact wheel situated at B. The spear point below C is fixed in a convenient position; the tracing point below A moves round the outline of shape while the wheel at B operates the calibrating mechanism. Any closed area swept out by moving point A is therefore directly proportional

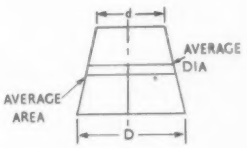
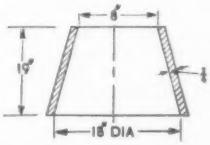


Fig. 12 (*above*).

Fig. 13 (*below*).



to the number of rotations made by the wheel at B. When one circuit of the outline of the shape has been completed a reading is taken from the dial at B. The reading can be made to three decimal places as the Vernier principle is applied. An even more accurate estimate can be made by making circuits in anti-clockwise and clockwise-directions, then taking an average of both readings. The reading on the dial before the instrument was used is subtracted from the average to provide the final figure.

In some instruments two pins protrude above C and D, this distance is the constant (the arm CD being telescopic) and when this constant is multiplied by the final reading the average area of the shape is obtained. Finally, to establish the actual area, the area of the shape is multiplied by the scale (3 in. = 1 ft.) squared, *i.e.*, 4^2. An example is tabulated in Table 4 on p. 820.

Conical and Spherical Shapes

The formula for estimating the volume of a cone is $\frac{1}{3} \pi R^2 h$, and for a sphere $\frac{2}{3} \pi R^3$. It is, however, very seldom (if ever) that castings of these shapes will be required. Nevertheless, many are made, of which a section is conical, or spherical, in shape.

Calculation of Casting Weights

A common error when finding the volume of a part which is conical in shape, is to assume that the average radius can be used and the formula $\frac{1}{3}\pi R^2h$ applied, but is incorrect as it is the average area which is important, and they do not both occur in the same plane. The average area will always be nearer D (see Fig. 12). Therefore, when the average radius is used, the final estimate will always be underweight; the amount of error decreasing as the difference between D and d decreases.

Hollow-conical steel casting

The average area of the section is the difference between the average areas bounded by the outside and inside conical surfaces. Let D be 18 in. and d be 8 in. (inner dimensions, Fig. 13). As the $\frac{1}{4}$-in. section is likely to increase to $\frac{3}{16}$ in. at top and bottom faces measuring across the horizontal, let D_1 be $19\frac{1}{2}$ and d_1 be $9\frac{1}{2}$, where the suffix indicates the outer dimensions. Therefore, the formula $\frac{1}{3}\pi R^2h$ becomes† 0.3927^* $[(D_1^2 + d_1^2) - (D^2 + d^2)]$. The mean section area is, therefore:— 0.3927 $[(19\frac{1}{2}^2 + 9\frac{1}{2}^2) - (18^2 + 8^2)]$, which simplifies to, 0.3927 (477.6 − 388), or 0.3927 by 89.6, making 35.2 sq. in.; and volume being area by height, we get 35.2 by 19, which is 669 cu. in. to the nearest whole number. The weight will be 669 by 0.28 (see Table 2), totalling 188 lb. to the next highest whole number.

Segment of sphere

Any part of a cast-iron sphere cut across the axis line or above has the following formula to find the volume:— $\frac{\pi H}{6}(3R^2+H^2)$ (see Fig. 14).

Therefore, the segment of a hollow shell will be:—

$$\frac{\pi H}{6}(3R^2+H^2) - \frac{\pi H_1}{6}(3R_1^2+H_1^2),$$

where the suffix indicates the inner dimensions.

Fig. 15 shows a segment of a hollow cast-iron sphere. It will be appreciated that the volume of the shell will be the difference between the outer and the inner solid segments, i.e.:—

Volume of hollow segment shell

$$= \frac{\pi H}{6}(3R^2 + H^2) - \frac{\pi H_1}{6}(3R_1^2 + H_1^2),$$

$$= \frac{\pi}{6}\left[H\,(3R^2+H^2) - H_1\,(3R_1^2+H_1^2)\right]$$

where the suffix indicates the inner dimensions Inserting the values in Fig. 14, this becomes:—

Volume = 0.522 [12 {(3 by 22^2) + 12^2} − 11 {(3 by 21^2) 11^2}]

= 0.522 {(12 by 1,596) − (11 by 1,444)}

= 0.522 by 3,268

= 1,706 cu. in. to the nearest whole number.

Therefore weight = 1,706 by 0·26 (see Table 2)

= 443·56 lb.

TABLE 4.—*Use of Planimeter.*

	Dial reading.	Difference.	Average.	Constant.	Area (as drawn).	Scale (Squared)	Area (actual) in sq. in.
Before use	7.392						
1st cycle (clockwise)	8.562	1.170	1.185	8.25	9.77	16	156.32
2nd cycle (anti-clockwise)	9.762	1.200					

Aids to Calculation

Slide-rule

A silde-rule should be the main tool used for rapid calculations. Many foundrymen shy-away from this instrument yet have pen-recording thermagraphs on their core-ovens and many other technical aids. The slide-rule is really a simple tool and is absolutely essential for rapid calculations whether they are being carried out by a moulder, or a top-level scientist.

Logarithms

Next to the slide-rule, logarithms are the most rapid method of calculation and have advantages over the slide-rule when larger numbers (four- and five-figures are involved—the slide-rule being less accurate for these high-values. Logarithms take a little time to learn, but no longer than the time taken to learn how to operate a new type of moulding machine.

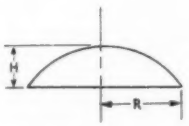


Fig. 14.

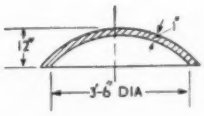


Fig. 15.

Tables

Many booklets of tables are available which have areas recorded corresponding to various diameters, and even weights per ft. length of different metals of regular-section, are often included. These tables can reduce working, and therefore reduce errors to a minimum.

Arithmetic

Arithmetic is useful only when it can be performed mentally; otherwise it is clumsy and obsolete. Discard it for long calculations as you would a broken hammer-shaft or worn-out spanner.

Conclusions

Science has, over the years, derived formulæ

* $\frac{1}{3}\pi R^2h$ is here applied in the more convenient form $\frac{\frac{1}{3}\pi D^2h}{4}$ (where D is the section diameter). 0.3927 is the solution of $\frac{\pi}{4}$ divided by 2 to obtain the average diameter. It is a common factor for this type of calculation.

† When expanded.

and provided foundrymen with efficient equipment. Wherever it is appropriate this should be used. Technical colleges exist for the sole purpose of bringing science and industry closer together, and if this article fails to produce a clear understanding of the subject of calculation, it is well to remember that local technical colleges are at the foundryman's disposal. These can provide advice when required, the help of qualified lecturers being always available. Where there is a need local technical colleges should be asked to undertake short courses of instruction on specialist aspects of foundry practice as for example that detailed in this article—a service which if repeated from time to time would be of real benefit to the industry.

ABBF Notes

The December meeting of London-area members of the Association of Bronze & Brass Founders at the Clarendon Restaurant, Hammersmith, on the afternoon of December 13, was preceded by the Christmas luncheon in the same premises. At both gatherings, the chair was taken by Mr. J. P. Webster (deputizing for Mr. W. R. Buxton who was unavoidably absent), and Mr. H. Rogers, for the secretaries, was also in attendance. Items on the agenda included the future of the Association, assessment of production of castings and metal used; the proposed "Non-Ferrous Foundry Regulations"; the ingot position and scrap exports; and the state of the metal market. "Other business" brought discussion of the impending National Apprentice Competition (as a prelude to the European event), current course vacancies at the National Foundry Craft Training Centre and the next meeting (provisionally fixed for March 8, 1961). In the discussion on the apprentice competition, the opinion was expressed by one member that the National Service call-up had to some extent "killed" the old-time apprentice system because it unsettled a boy, disrupted his outlook and the sequence of his training and industrial experience.

* See JOURNAL December 15, 1960, page 763

ISHIRA Assets Sale

Progress in denationalization of the steel industry during 1959-60 included the sale of four more companies and the liquidation of another, reducing the number of companies still directly owned by the Iron and Steel Holding and Realisation Agency to seven, states the agency's annual report for the year to September 30, 1960, published on Thursday, December 15. Total value of enterprises returned to private ownership in the year was £10,000,000 and the realization of assets up to September 30 was £250,000,000.

Most important subsidiary of the agency, which accounts for three quarters of the value of the wholly-owned assets remaining under its charge, is Richard Thomas & Baldwins, Limited. The integrated steelworks now being built at Newport (Mon) for RTB will cost about £119,000,000.

An interest is still retained by the agency in 11 companies, including Colvilles, Limited, Consett Iron Company, Limited, Dorman, Long & Company, Limited, Guest, Keen & Nettlefolds, Limited, John Summers & Sons, Limited, Stewarts and Lloyds, Limited, Steel Company of Wales, Limited, and the United Steel Companies, Limited, but since September 30 the agency has sold its holding of £1,050,000 of 4½ per cent. redeemable debenture stock, 1970-85 in the Whitehead Iron & Steel Company, Limited.

London Firm's Diamond Jubilee

Wolf Electric Tools' Celebration

At the close of 1960, Wolf Electric Tools, Limited, Pioneer Works, Hanger Lane, London, W.5, celebrated their diamond jubilee. The company was founded in 1900 by Mr. Sidney Wolfe, as S. Wolfe & Company, in East London, for the importing and reselling of continental machine-tools. Almost as a side-line, he began to handle continental portable electric-tools which were sold under the brand name of Wolf. In these early days, electric tools—mostly restricted to drills—were extremely primitive, with no pretentions to ease of handling or good looks.

The outbreak of world-war I resulted in a very substantial increase in the demand for electric drills, bench stands and grinders which were manufactured at the company's London works. A small factory was opened at Kingston in 1932 and an entirely new range of tools was introduced under the brand name British Wolf. The success of this project soon justified the building of a new factory and, in 1935, the present factory was built at Ealing, London, W.5. The end of the second world war witnessed a great drive to reopen overseas markets, and the "highlight" of the early post-war years was the introduction in 1949 of the Wolf "Cub" range of domestic power-tools and equipment.

Export Drive

It is interesting to note that the company's jubilee year is being celebrated by an export drive, and seldom a week passes without a visit by an executive of the firm to one or more of the 70 overseas countries in which their tools are established. Over the years, sales and service branches have been established at Birmingham, Bristol, Glasgow, Leeds, Manchester and Newcastle. Overseas, a recently-enlarged branch in Toronto is meeting Canadian needs; separate manufacturing and sales companies are flourishing in Australia, and in India a joint manufacturing enterprise in Bombay is being developed in collaboration with Indian interests.

The original works has been extended on several occasions and two adjoining factories taken over, with a third one—offering an additional 50,000 sq. ft. of production space—due for occupation early in 1961. Also, four sizeable factories are in operation by the firm on the Slough Trading Estate.

Newton Chambers acquire Royston's

The business of George Royston and Son, Limited, of Pogmoor, Barnsley, has been acquired by Newton Chambers and Company, Limited, of Thorncliffe, Sheffield. The Royston company designs and manufactures chemical plant and equipment fabricated in mild steel, stainless steel, aluminium and special alloys, and specialises in sulphate of ammonia plants for the manufacture of Grade A sulphate.

Under the new arrangement Mr. K. E. Walker, director in charge of the engineering division of Newton Chambers, will be chairman of the company, and Mr. D. B. Royston will continue as managing director. Mr. E. H. King, a chartered accountant and company director in the Midlands will continue on the board, together with Mr. M. W. Wilby, former secretary, who will be responsible for day-to-day management. Joining the new board from the engineering division of Newton Chambers will be Mr. S. B. Rippon, general sales manager; Mr. K. Sheard, contracts manager; and Mr. R. Middleton, engineering sales manager. Mr. R. J. V. Wheeler, secretary of Newton Chambers, will be secretary of the company.

American Letter

Rising Steel Imports to USA

Speaking at the general meeting of the American Iron and Steel Institute at New York as long ago as May last, Mr. Leslie B. Worthington, president of the United States Steel Corporation, said: "Foreign competition is likely to be with us from now on. It may hurt a little less one year than another, but it won't go away like a bad dream and will make itself felt in more and more steel products. We will be under pressure from more and more foreign producers."

It is no secret that imports into the US have made inroads in all fields, from steel to ferro-alloys to finished metal products. The American magazine *Steel* reports that in 1959, the US imported 3.0 million tons (American tons) more finished steel than in 1957 (see Fig. 1). Exports, however, were down by 3.7 million tons. These 6.7 million tons of "lost" steel products are equal to 10 million tons of steel ingots, or about 11 per cent. of the US 1959 production.

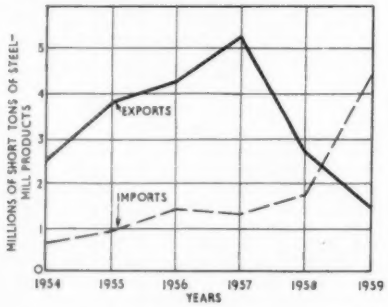


FIG. 1.—*Imports and exports of American steel-mill products.*

The reasons for increasing imports have been widely publicized in the US, one important cause being the difference in wage rates. For example, American steelmakers earn seven times as much as Japanese steelworkers, four times as much as German, and three and one-half times as much as British steelworkers. Also, US ferro-alloy producers' wage-rates are up to 10 times as much as foreign rates. Thus, to-day US labour rates to produce one ton of steel are about $60 compared to about $12 to $14 in Western Europe, and $7 to $8 in Japan. US producers no longer have the technical superiority to overcome this tremendous cost difference, the article continues. American foreign-aid programmes have helped finance modern industrial plants overseas and US producers have shared technical "know how" with politically friendly countries who now compete with them. Also, many foreign governments provide favourable financial and economic conditions to encourage growth, especially in exports. Thus, foreign steelmakers can flood world and American markets with steel that is $30 to $40 per ton under the costs of American mills.

"The problem of meeting foreign competition is not hopeless," Mr. Worthington told the AISI. He then dealt with service, quality and availability—assets, he said, that the foreign producer could not offer. Dealing first with service, he said that most American producers offered valuable metallurgical service to their customers; foreign producers didn't. Quality, Mr. Worthington said, was the strongest of all possible sales features and it was present in the US domestic steel-products. Sustained quality was particularly important as mechanization grew; machines could not cope with variations in thickness, hardness, or other properties. Turning to availability, US steelmakers, he said, went to great lengths to make sure their products were delivered when their customers wanted them. Foreign deliveries took longer and were a lot less certain. Thus, service, quality and availability were the US triple line of attack against competition from foreign producers.

Steel Castings' Production in Europe

In a report presented at the 1960 annual meeting of the American Society of Mechanical Engineers, held in New York City, from November 27 to December 2, Mr. J. H. Lowe (vice-president, Keokuk Steel Casting Company, Keokuk, Iowa) surveyed steel-casting production in Western Europe. This survey followed a trip the author had made to several western European countries during the course of which he visited shops in Great Britain, Belgium, France, Germany and Scandinavia.

He reported that the progress in science and engineering in Europe exceeded US practice, but that mechanization and productivity excelled in the US, and he felt that the US advantage was due to the greater quantity of castings produced per pattern. Middle-western US shops, he stated, were accustomed to large volume and specialized equipment was employed, and high output permitted production at low prices. In the eastern US, where quantities per order were smaller, the above advantage would be less and, in some cases, results were inferior to the productivity of Great Britain and Germany. This factor was measured in terms of man/hr. per ton of castings. Mechanization in US operations was tied to the high labour-costs and the larger number of castings per pattern per order.

In European production, with a smaller market and a smaller quantity of castings per pattern, there was exerted more attention to control and engineering procedures and European laboratories were well equipped and well staffed. As an example, knowledge of engineering properties of castings in different section-thicknesses was well developed for many specific castings. "Furnacing" practice in one case had achieved a level of determining the gas content of metal in the furnace prior to casting—as a routine procedure. Another innovation involved heat-treatment in a furnace chamber divided into cubicles, capable of delivering temperatures ranging from 150 to 1,000 deg. C. in the separate compartments. This was intended to provide flexibility for complex heat-treatment.

The author felt that generally speaking the finish of US castings was superior to that of castings produced in European shops, but that the latter frequently delivered rough-machined castings which enabled them to improve the casting finish and detect and reject defective castings. Mr. Lowe's report was supported by slides showing a number of tables covering costs per ton of castings, man/hr. per ton of castings, comparative labour-rates and labour costs.

S.-g. Iron Production

The production of spheroidal-graphite iron in the US is reported as moving at a rate of about 200,000 tons per annum, with an about equal amount for Europe and the rest of the world. By tracing these figures down to their origin 10 years ago, the progression seems to have moved at an approximate annual increase of 20,000 tons with the end not yet in sight, it is stated.

Preliminary Report on a New Running Technique

*By K. Pearce A.M.C.T.**

In spite of the fact that quite a large amount of research has been carried out into methods of running and gating sand castings[1] there does not appear to be general agreement on "ideal" methods. Many good procedures are too complicated for application on practical and economic grounds. A brief discussion of these methods is followed by a preliminary report on a technique which appears to have escaped mention in the literature and should find immediate application for certain alloys.

In general, the design of the runner system of a mould is not given fundamental consideration. In small loose-pattern work the provision of a runner is often left to the moulder's experience and ability with a teaspoon. The running system on larger castings usually consists of a sprue leading straight into a horizontal ingate. It is not usual to hear reference to gating ratios in either of these cases. The situation is somewhat different where plated work is concerned. Although in this instance the provision of the runner system is frequently left to the patternmaker, it is also quite commonly the result of liaison between the foundry and patternshop. In this case, the system embodies various accepted principles of running and gating and it is not uncommon for sprue : runner : ingate ratios to be predetermined.

General Principles

Two requirements of a running system are that it should introduce the metal into the mould cavity quietly and without the production of dross or slag. If the first requirement is to be met, immediately the metal enters the mould cavity, the advancing wall of metal must completely fill the cross-section of the runner and force all the gas present before it. The failure of many systems to fulfil this objective is evidenced by an erratic flow and spluttering which accompanies the first metal to enter the mould cavity. The time which elapses between metal first entering the runner system and the removal of all the air present is often referred to as the "clean up time." In systems which do not lead into the base of the mould cavity the clean up time is dependent on their design and appears to vary from a minimum of one second[2] to infinity[3]. Using the minimum period for, say a 0.5-in. dia. sprue, approximately 0.75 lb. of metal would have entered the mould in an unsatisfactory manner before a steady state of flow was attained.

To avoid excessive turbulence in the mould cavity, it is essential that the metal at the ingates has a low velocity. An indication of the relation between the velocity of a liquid and its trajectory is given in Fig. 1, the distances being calculated from the relationship:—$\text{Velocity} = S\sqrt{\frac{2g}{h}}$

Where h is the height that the liquid stream falls before reaching the bottom of the mould cavity, and S represents the "jet effect" or horizontal component of the distance travelled by the metal stream at its point of arrival on the mould bottom, from its point of entry into the mould cavity.

The velocity of a stream of liquid metal at the base of the sprue is due to gravitational acceleration in the sprue. If the velocity is to be decreased, energy must be either absorbed, or the cross-sectional area of the stream increased. Energy is absorbed by causing the liquid to change direction, or by generally increasing the turbulence. Sudden changes of this nature, which cause the highest losses in energy, can be detrimental, causing aspiration and the formation of dross or slag. Energy is also lost because of the viscosity of the liquid metal. The effect of this is greatest when the ratio of the perimeter of the cross-section of the channel to the area, is large. This principle is applied in pencil-gates and the system is usually pressurised, *i.e.* the ingate area is equal to or less than the sprue area.

Velocity Control

Although the absorption of energy by the above methods causes a reduction in velocity, it also reduces the rate of flow; for this and various other reasons it has a limited application and the principle of increasing the cross-sectional area is applied. This is based on the fact that if the cross-sectional area of a stream of liquid is doubled the velocity must be halved. According to the literature[1] most workers take the view that the velocity of the metal at the base of the sprue should be reduced by, from four to six times. The velocity of aluminium at the base of a 9-in. deep taper sprue is 70 in. per sec., a reduction of five times would result in a velocity of 14 in. per sec. From Fig. 1 it can be seen that this would give a jet effect of less than 2 in. If this reduction in velocity were to be brought about solely by increasing the cross-sectional area it would require, for example, a $\frac{1}{2}$-in. square sprue to enter a 1 in. by $1\frac{1}{4}$ in. runner. It would, of course, be essential for the whole cross-section of the runner to be full. In practice, this would be so only when the level of metal in the mould was above the top of the ingates. This general principle is applied mainly to bottom-run castings.

* The Author is attached to the Department of Chemical Engineering, Fuel Technology and Metallurgy of the Manchester College of Science and Technology.

New Running Technique

Many combinations of the two basic-methods of reducing velocity have been suggested but none of them appears to overcome all the inherent disadvantages.

Preliminary Experiments

When a liquid flows round a sharp bend in a pipe there is a tendency for it to separate from the pipe wall as indicated by the cross-hatched area in Fig. 2. The velocity head at the wall in this area is at a minimum and it was expected that if the main stream of the liquid could be forced to take this direction it should also have a reduced velocity.

To verify this idea, a runner system was constructed as shown in Fig. 3. The mould was cut so that the metal flow in the 6 in. by 6 in. by ¼ in. channel could be observed, the end of the channel being open. Thirty pounds of aluminium at 850 deg. C. was poured through the system, the height of metal in the pouring basin being maintained at 2 in. The mould was carefully sectioned and the two 6 in. by 6 in. faces of the channel examined.

When the metal first entered the channel, it rose up the walls at the closed end to a height of about 4 in. The metal then commenced to fall back again moving away from the closed end. Coincident with this falling back of the initial spurt the height to which the following metal rose, decreased slightly and then remained constant. The metal levelled off in the remainder of the channel and appeared to flow quietly without any sign of entrained air.

On examining the sides of the channel, the level the metal had maintained was clearly marked—this is sketched in Fig. 4. As the level of metal in the ¼ in. wide channel was ¾ in., it occupied a cross-sectional area of 0.375 sq. in. This area is 3.4 times that of the sprue base and represents a reduction in velocity of that order. Any loss of energy due to the design of the system itself would, of course, cause an additional reduction in velocity.

Hydraulic theory suggests that in addition to the loss in specific energy due to the reversal in the direction of the flow, some loss should also occur in the section of the stream, where the metal rising up the channel under its momentum, is in contact with that falling due to gravity. This experiment indicates that channels up to ¼ in. wide by at least ¾ in. high should be filled by an initial wall of metal advancing in a horizontal direction. This would result in an immediate reduction in velocity and infinitely small clean-up time.

Further Experiments

Additional moulds were made in Mansfield-red sand, and cast "green." The dimension of the runner systems were the same as in Fig. 3 except that the large open channel was replaced by closed ingates of various sizes. If a riser was used it consisted of a ¼-in. dia. by 6-in. hole above the point where the ¼-in. square runner-bar entered the bottom of the ingate. Vents ¼-in. dia. were taken off the top of the system to indicate the pressure. The metal used was aluminium melted in a forced-draught coke-furnace or high-frequency induction furnace; it was degassed and poured at 850 deg. C. The height of metal in the pouring basin was maintained between 1¾ and 2¼ in. As soon as the correct level of metal in the basin was attained the metal issuing from the end of the ingate for a period of 5 to 8 secs. was caught in a hand-shank and weighed. The first metal to flow along the ingate was observed through a safety screen. The ingate was finally sectioned to determine whether or not it had been full of liquid.

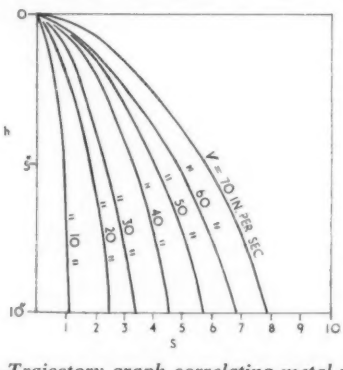


FIG. 1.—*Trajectory graph correlating metal velocity with jet effect., "O" represents the point of entry of the metal stream from the ingate falling into a hypothetical mould cavity* 10*-in. deep.*

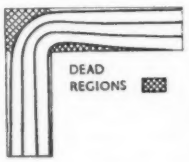


FIG. 2.—*Represents a section through a liquid flowing around a sharp bend in a horizontal pipe and indicates (hatched) areas of reduced velocity.*

Comments

Metal appeared to fill the entrance to the ingate immediately and advance towards the exit in an unbroken stream. The flow of metal from the ingate exit was smooth the whole time. In the ¼-in. high ingate, the advancing stream filled it completely along the full 6-in. length. In the larger ingates the initial stream of metal parted from the top of the ingate some distance from the entrance. This distance increased to a maximum as the height of metal in the pouring basin rose to 2 in. This maximum value decreased as the height of the ingate increased from ½ by ¼-in.—see group A, Table 1.

The separation of the metal from the top of the ingate under steady static conditions took place at the top corners and did not necessarily extend

TABLE 1.—*Experimental Results.*

Ingate details.	Ingate area, sq. in.	Flow rate, lb. per sec.	Velocity, in. per sec.	Ratio.	Remarks.
0.58 to 0.375 in. taper sprue 9 in. deep only	0.11	0.66	70		
A ½ by ¼ in. high with riser	0.125	0.43 0.45 0.43	40 41.9 40	1:1.28:1.14	Exit completely full.
A ½ by ¼ in. without riser ..		0.42	39		
A ½ by ⅛ in. with riser ..	0.25	0.62 0.57 0.55	28.8 26.5 25.6	1:1.28:2.27	Slight separation at top corners for a maximum distance of ⅛ in. from the exit.
A ½ by ⅛ in. without riser ..		0.54	25.1		
A ½ by ⅜ in. with riser ..	0.375	0.51 0.48	15.7 14.7	1:1.28:3.41	Separation at the top corners for a distance of 1 in from the exit.
A ½ by ⅜ in. without riser ..		0.58 0.57 0.56	17.8 17.5 17.2		
A ½ by 1 in. without riser ..	0.5	0.62	13.6	1:1.28:4.54	Separation at top corners 2 in. from exit. Complete separation 1⅜ in. from exit.
B ½ by ⅜ in. modified riser (Fig. 6)	0.375	0.52	16		Negligible separation at ingate exit.

right across the top. This separation is perhaps, in part, caused by the surface tension of the liquid overcoming the low static-pressure, present in the ingate due to the high loss of pressure at the bend. The pressure in the ingate decreased as the cross-sectional area increased. Separation due to this effect could probably be prevented by radiusing the top corners of the ingate.

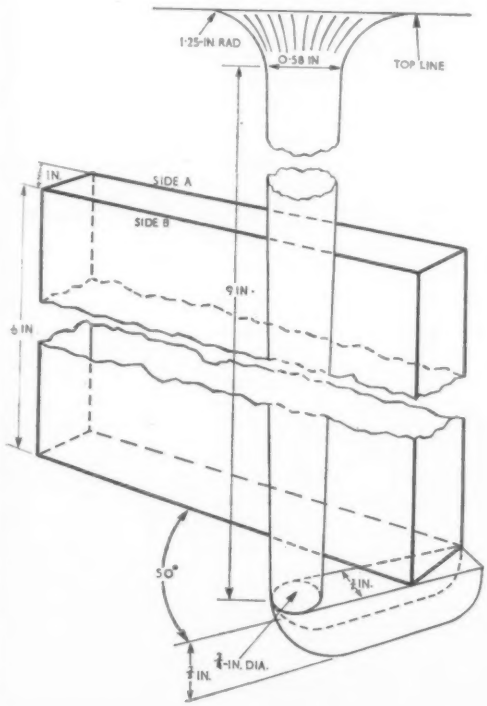
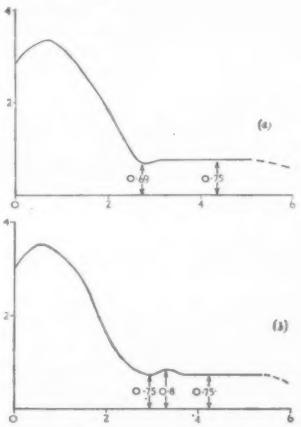


FIG. 3.—*Schematic sketch of mould section indicating position and dimensions of experimental ingate.*



FIGS. 4 (*a and b*).—*Illustrates metal behaviour in the first experimental moulds and shows the initial climb of the metal stream up the open ingate face before levelling off.*

It can be seen from Table 1 that as the cross-sectional area of the ingate increased, the velocity decreased. As indicated previously, the velocity calculated on this basis cannot be true, if the whole cross-section is not full. In all systems over ½ in. by ¼-in. in group A, the ingate was not completely full at the exit; because of this the actual velocity at the exit would be somewhat higher than that calculated. It is unlikely that the more

New Running Technique

extensive separation occurring at the exit in the ¼ and 1-in. high ingates is due entirely to the surface tension effects, as already discussed. The cause in these instances is probably locally high velocities, and dead regions, associated with the bend as indicated in Fig. 5. The calculated velocity is, of course, the average over this cross-section; approximate measurements of the exit velocity by trajectory methods confirmed that the actual velocity was somewhat higher than that calculated by the volume-divided-by-area method.

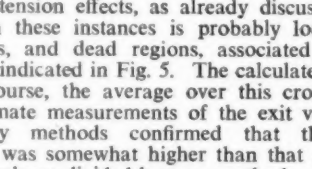


FIG. 5.—*Vertical section of the ingate region showing the suggested flow in the "A" group of experimental moulds.*

It was observed that separation at the exit tended to be less when a ½-in. dia. riser was attached to the ingate entrance above the cross-runner. A modified ingate was tried, Fig. 6, and this reduced the separation at the ingate exit to a negligible amount. Electrical contact methods and post mortem examination of the mould revealed that separation occurred at point A, Fig. 6, if the radius R was less than ¾-in.

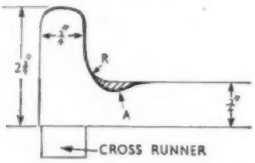


FIG. 6.—*Vertical section through the modified closed ingate indicating the ¾-in. dia. by 2¾-in. high riser situated immediately above the ingate which helps to reduce the metal separation to a minimum.*

N_R for flow in the ¾-in. high channel is just over 4,000, which is the upper critical velocity for streamline flow. The flow will therefore be turbulent as it is in the majority of gating systems.

Conclusions

Although further work is still required to establish the optimum dimensions of the various parts of the system, it appears in principle to overcome some of the faults in present gating systems. The full cross-section is filled progressively without relying on choke of the ingates or back pressure in the mould cavity; clean-up time is reduced to a negligible period; and an immediate reduction in velocity is effected without initial spluttering.

The experiments have been carried out using normal loose pattern moulding techniques and complicated radii have been avoided therefore keeping the system practically simple. The actual dimensions used are not too critical. The yield will be greater than that given when the more efficient of the well-type sprue bases are used. It should be possible to apply the technique to small loose-pattern and plated work in non-drossing alloys, and it should prove equally applicable to larger castings. The excessive turbulence caused by the bend may preclude the application of the technique to drossing-type alloys.

Acknowledgments

The Author expresses his thanks to Professor F. Morton and Dr. H. J. Bray of the Department of Chemical Engineering, Fuel Technology and Metallurgy, the Manchester College of Science and Technology, for the facilities provided.

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[3] K. Grube, J. G. Kura and J. H. Jackson, *ibid.*, 1952, **60**, 125.

Tom Makemson Memorial Award

Presentation of the fifth annual Tom Makemson medal and prize was made to Mr. C. A. Ruff by Mr. G. R. Shotton, national president of the Institute of British Foundrymen, at a meeting in Derby of the East Midlands branch of the Institute early this month. Mr. Ruff received the award for getting the highest marks in the City and Guilds advanced examination in patternmaking in 1960. The award winner served his apprenticeship with International Combustion, Limited, Derby (where he has worked for six years) and has studied at the Derby College of Technology. He hopes to obtain his full technological certificate by further evening studies at that college and later to take part in a course at the National Foundry College at Wolverhampton.

Foundry Acquired by Opperman Gears

Opperman Gears (Holdings), Limited, announce the purchase of W. J. Mariner & Company, Limited, non-ferrous founders of Luton, Bedfordshire, with effect from November 30, 1960. Formed more than 50 years ago, Mariners originally made non-ferrous castings for marine and general-engineering applications. From 1914 to 1918 the company was engaged almost exclusively on Admiralty work. In the following years their activities broadened so that to-day castings are supplied for a wide range of applications besides current Admiralty contracts. Mr. E. R. Opperman is now the chairman of W. J. Mariner and Mr. J. A. Mariner, the son of the founder, who joined the firm in 1914, continues as managing director. Also on the board of directors are Mr. W. B. McCurd and Mr. P. S. Lane.

IT HAS BEEN ANNOUNCED that the US firm of Cessna Aircraft, Kansas, is to open a factory at Dunfermline for the manufacture of its valves, pumps, and rams, mainly for agricultural and earth-moving machinery.

Notes from the Branches

London

A record turnout of over 370 members, guests and ladies of the London branch of the Institute of British Foundrymen attended the annual "ladies' night," held at the Connaught Rooms in London, on Friday, December 9. Whether this number could be taken as appreciation of the function's return to the Connaught Rooms, its previous venue, or whether it represented an endorsement of the new policy to extend the closing hour to 1 a.m. is open to conjecture, but certainly the party was a brilliant one and there was no dwindling of numbers even after midnight.

Members and guests were welcomed early in the evening by Mr. D. A. C. Hutchison, president, accompanied by Mrs. Hutchison, and the national IBF president and his wife, Mr. and Mrs. G. R. Shotton. Other prominent IBF members among official and individual members' guests included the presidents of the Birmingham and Lancashire branches, the secretary of the East Midlands branch, foundrymen from north of the Border, and the national secretary, nearly all of whom were accompanied by their ladies.

Speeches after the meal were minimum in number, and well reflected the informality with which this occasion is treated in London. After the Loyal Toast, Mr. Shotton proposed that of the "London Branch" coupled with a welcome to the ladies, and the branch president responded. The rest of the proceedings were in the hands of Peter Alan's RAC dance band and cabaret artists, Robert Harbin of Magic Circle fame and Miss Jeanne Waugh, the Valli Trio singer. Proof of the evening's success was the fact that the call for the National Anthem at 1 a.m. was greeted with cries of regret, so swiftly and unnoticed had the time flown.

Informal photographs taken during the London branch dinner/dance on December 9. In the upper picture, on the left, Mr. and Mrs. R. E. Berry (from Ipswich) are shown with Mrs. L. A. S. Harbourne (wife of the branch's chief steward), and on the right, Mr. M. M. Hallett (Birmingham branch president) and Mrs. Hallett are shown chatting to Mr. D. A. C. Hutchison (London branch president) and Mrs. Hutchison. The lower illustrations show, on the left, Mr. T. Wills (London branch assistant secretary) with his wife and daughter, and on the right, Mr. G. R. Shotton (IBF national president) and Mrs. Shotton photographed while assisting at the reception of guests.

From left to right: Mr. K. Marshall, Mrs. Marshall, Mrs. Shotton, Mr. G. R. Shotton, Mrs. Cooper and Mr. R. W. Cooper, at the annual dinner of the IBF Coventry section held at the Leofric Hotel.

Coventry Section

The Coventry section held its annual dinner/dance in November at the Hotel Leofric, Coventry, Mr. R. W. Cooper, branch president, presiding. Mr. and Mrs. Cooper were assisted by Mr. G. R. Shotton, IBF president, and Mrs. Shotton in receiving the 270 members and guests who attended. The toast to the "Institute and the Section" was proposed by the principal guest, Mr. K. Marshall, director of the Joint Iron Council, who forecast a bright and sound future for the ironfoundry industry. It was wrong, he said, to assume that the difficult time Coventry was now experiencing would repeat the pattern of 20, 30, or 40 years ago; the problem to-day was to combine stable prices with full employment. Mr. Cooper responded, and the other toast of the evening that of "The Guests" was proposed by Mr. D. Hancox, section past-president, and responded to by Mr. Shotton.

Following dinner, dancing continued until 2 a.m. to Barrie Phelps and the Hotel Leofric Orchestra. The joint masters of ceremony were Mr. D. F. Bailey and Mr. D. R. Fardoe.

South Africa

Over 10,000 miles were travelled by the members and guests present at the November meeting of the South African branch. There were almost 300 present at the function, providing one of the most representative gatherings of South African foundrymen, steelworks personnel and ferro-alloy producers. To present the paper, entitled "Latest Methods of Construction and Operation of Hot-blast Cupolas," by Mr. S. Tunder and Mr. L. Hohle, one of the authors (Mr. Tunder) travelled especially from Germany.

At the meeting, the branch president first introduced Mr. Tunder and welcomed members and guests from Cape Town, Port Elizabeth and Durban. Mr. Tunder commenced his lecture by stating that the economical and metallurgical advantages of melting with hot blast were well known and when a new foundry was planned hot blast was always seriously considered and often given preference to cold blast. For the same reason, many established foundries, he said, were rapidly changing from cold-blast to hot-blast melting. Metal at higher temperatures was obtained from hot-blast cupolas (Fig. 1 shows typical designs) than from cold-blast units, as the melting zone was normally only 8 to 12 in. deep, and coke could be burnt more rapidly in a short melting zone.

Acid-lined Units

In hot-blast cupolas, the author continued, the high temperature produced could result in the reduction of any SiO_2 present to Si. The higher the blast temperatures employed, the more silica was reduced, and a suitable temperature could be chosen where silica was completely reduced and eliminated the need for silicon addition to the metal charge. Savings in pig-iron and ferro-silicon could therefore be made.

With still-higher temperature, a silicon gain could be obtained in the metal melted, as a result of reducing the silica from the cupola bricks or sand adhering to the metal charges. The author explained that this phenomenon had led to the belief that for melting low-silicon metals—as for malleable iron—a blast temperature of over 400 deg. C. was not desirable. However, in today's melting practice high temperatures were employed, but the reduction of silica from the acid lining was kept under control. Some malleable foundries had obtained good results with a blast temperature of 700 deg. C., he added, these foundries were using sand-free returns and water-cooling the furnace in a very simple way—by spraying the shell at the melting zone.

Basic-lined Hot-blast Cupola

Due to the encouraging results obtained in acid-lined hot-blast (Fig 1(*a*)) cupolas, further attempts were made to utilize the hot-blast in basic-lined cupolas (Fig. 1(*b*)). This resulted in a revolutionary design of basic hot-blast cupola which was safe in operation and could run continuously for weeks, the author stated.

The lining consisted of a carbon mass in the well of the cupola and due to the extensive water-spraying of the cupola-shell, the melting zone and the upper part of the cupola-shell was provided with no lining whatsoever. Water cooling of tuyeres was sufficient to keep constant the diameter of the cupola at tuyere level and to prevent melting of the tuyeres themselves. If the shell tended to burn out at the melting zone, the slag provided an insulation material, as it hardened immediately on the shell due to the water-cooling at this point. A slag-separator, designed on the syphon principle, provided a sufficiently high volume of slag inside the cupola. Through this slag, which was thick and highly basic in character, the metal was cleaned and desulphurized as it dropped down into the well. This type of cupola could be in continuous operation for as long as eight weeks without any need for lining patching or repair, the author disclosed.

The main advantages of a basic hot-blast cupola were summarized as follow: High carbon-pick-up, along with metal of very low-sulphur content and gas-free, and the possibility to melt continuously for long periods. Such a unit could be very suitable for foundries requiring high tonnage without variation in metal quality.

Instrumentation

A modern hot-blast cupola could not be operated successfully without the proper instrumentation, Mr. Tunder went on to say. Both economic and metallurgical advantages of hot-blast plant could only be realized when the plant was controlled through proper instruments and the melting conditions maintained continuously at an optimum value. One of the most important of these control units was the combustion-air volume and pressure-recorder, the author stated. To guarantee satisfactory performance and to prevent damage to the recuperator, temperatures at four points should be measured, *viz*: (*a*) the combustion-chamber temperature; (*b*) the blast temperature; (*c*) the cupola-gas temperature, and (*d*) the temperature of combustion gases at the top of the recuperator.

Charging Equipment

The choice of the correct charging hoist and weighing equipment for a cupola installation was of great importance, said the author. This equipment had to save labour and at the same time ensure that the charge was of the required composition. Even today in many foundries the problem was not given the attention required and one could see old-fashioned and inefficient charging equipment still in use. Full advantage of modern hot-blast cupolas of the types illustrated could only be obtained when this problem was solved.

At the conclusion of the lecture, two films were shown depicting the operations of various types of hot-blast cupolas, the "shaking ladle" and the "LD" process. A lengthy and animated discussion followed the presentation of the paper and the films and at 10.30 p.m. the president had to end the discussion and called on Dr. J. Cannon to propose a vote of thanks. Dr. Cannon complimented the author on the excellence of his paper and of the films shown, also congratulating him on his admirable handling of the discussion.

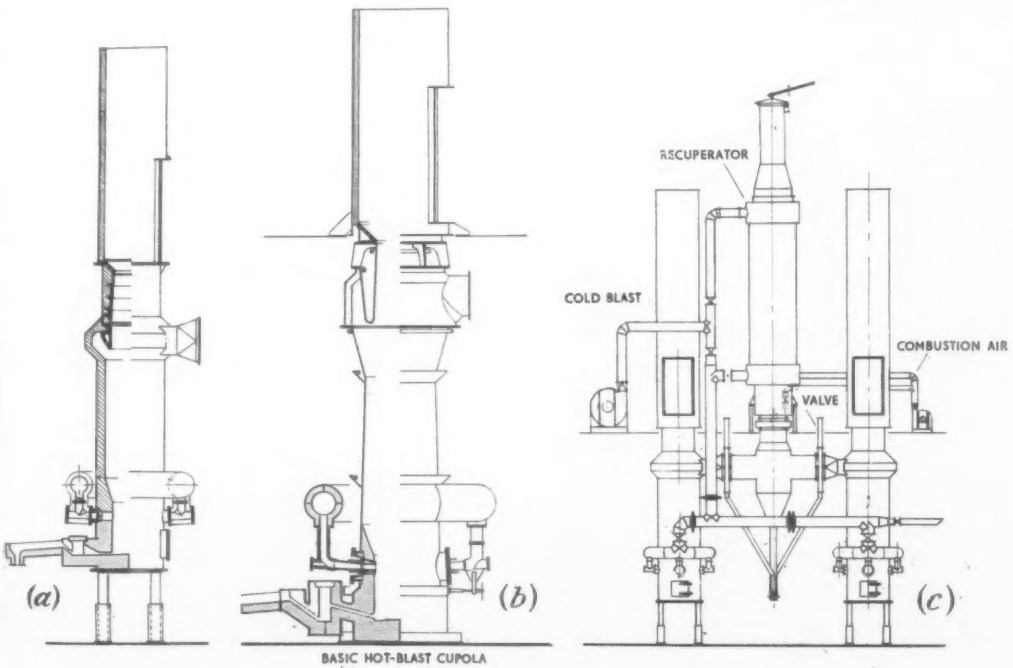
The vote of thanks was heartily applauded.

Natal Section

The September meeting of the Natal section took the form of a "Problems" evening, under the chairmanship of the president, Mr. J. Robertson. There were three speakers and three subjects as follow: Mr. A. Patterson on: "To pour from the Top or the Bottom?"; Mr. A. Mitchell on: "Casting a Rope Sheave," and Mr. F. V. Rice on "Casting a Thin Plate."

ORDERS WORTH more than £500,000 for over 200 six-wheeled, ten-ton tipping lorries have been received from Australia by Albion Motors, Limited, Glasgow.

FIG. 1.—*Outline sketches respectively of* (*a*) *and* (*b*) *acid-lined and basic-lined hot-blast cupolas, and* (*c*) *a pair of hot-blast cupolas provided with a radiation type of recuperator.*



British Blast Furnaces in the Third Quarter, 1960*

Derbyshire, Leicestershire, Notts, Northants, and Essex.

Name of firm.	In blast at end of the third quarter, 1960.					Weekly average in blast.	Total existing at end of quarter.
	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.		
Ford Motor	—	—	1	—	1	1	1
Holwell Iron	—	—	1	—	1	1	4
Renishaw Iron	—	1	1	—	2	1·3	2
Sheepbridge	—	2	—	—	2	2	2
Stanton Ironworks: Stanton-by-Dale	—	2	3	—	5	5	5
Staveley Iron & Chemical	—	1	3	—	4	4	4
Stewarts and Lloyds: Corby	—	4	—	—	4	4	4
Wellingboro' Iron	—	2	—	—	2	2	3
TOTAL	—	12	9	—	21	20·3	25
Lancashire (excl. N.-W. Coast), Denbighshire, Flintshire, and Cheshire.							
Brymbo Steel Works	—	1	—	—	1	1	1
Darwen & Mostyn Iron	—	—	—	1	1	1	2
Lancashire Steel Manufacturing	—	2	—	1	3	3	4
Summers, John	—	2	—	—	2	1·9	2
TOTAL	—	5	—	2	7	6.9	9
North-West Coast.							
Barrow Ironworks	2	—	—	—	2	2	4
Charcoal Iron	—	—	—	—	—	—	1
Millom Hematite Ore & Iron	2	—	—	—	2	2	3
United Steel: Workington	2	—	—	1	3	3	3
TOTAL	6	—	—	1	7	7	11
Lincolnshire.							
Appleby-Frodingham Steel	—	4	—	—	4	4	4
Lysaght's Scunthorpe Works	—	3	—	—	3	3	3
Thomas, R., & Baldwins: Redbourn	—	3	—	—	3	2·3	3
TOTAL	—	10	—	—	10	9.3	10
North-East Coast.							
Consett Iron	—	3	—	—	3	2.7	3
Dorman Long (Steel): Acklam	—	2	—	—	2	2	4
Redcar	—	—	—	—	—	—	2
Bessemer	—	2	—	1	3	3	3
Clay Lane	—	2	—	—	2	2	2
Gjers, Mills	2	—	—	—	2	2	3
Skinningrove Iron	—	2	—	—	2	1.9	3
South Durham Steel & Iron: West Hartlepool	—	2	—	—	2	2	3
Cargo Fleet	—	2	—	—	2	2	3
TOTAL	2	15	—	1	18	17.6	26
Scotland.							
Bairds & Scottish Steel: Gartsherrie	—	1	1	—	2	2	4
Carron	—	—	1	—	1	1	2
Colvilles: Clyde Iron Works	—	3	—	—	3	3	3
Ravenscraig	—	1	—	—	1	1	1
TOTAL	—	5	2	—	7	7	10
South Wales and Monmouthshire.							
Guest Keen Iron & Steel: Cardiff	—	2	1	—	3	3	4
Thomas, R., & Baldwins: Ebbw Vale	—	3	—	—	3	2.5	3
Steel Company of Wales: Margam	—	4	—	—	4	4.5	5
TOTAL	—	9	1	—	10	10	12

(These tables are published through the courtesy of the British Iron and Steel Federation.)

THOS. FIRTH AND JOHN BROWN, LIMITED, and Firth-Brown Tools, Limited, Sheffield, entertained 300 pensioners to a Christmas tea in the works canteen on December 21.

Mr. F. THOMPSON-SCHWAB, chairman of the Darwin Group, presented long-service awards and group education awards to the staff of Darwins, Limited, Tinsley, Sheffield, on December 19.

"Gilt-Edged" Prospects

Speaking at an "Open Evening" for foundry trade apprentices at the Walsall Technical College, Mr. J. B. McIntyre, senior lecturer at the National Foundry College, Wolverhampton, said that foundry work was "the only vocational gold mine left in industry," with considerably better prospects than could be found anywhere else in Britain. In no other sphere could the non-graduate progress so far. At first sight, he said, the foundry lacked the glamour of the automobile and engineering industries, but the foundry industry, where there was no limit to opportunities for the brilliant, also had a place for the man who wanted a steady job. There was plenty of scope for those who liked precision, but in its 5,000 years' history the foundry industry had always needed the moulder and pattern maker who was simply intelligent and ingenious. There were big modern foundries for those who liked mechanization and plenty of small foundries for men who preferred craftsmanship. At present there was a tremendous shortage of trained men, Mr. McIntyre went on, "the work is not easy but the industry offers better prospects for the thinking man than any other.

Mr. G. Reeve, of the United Pattern Makers' Association, gave an example of the qualities required by a foundryman, saying he now had to use every material from metal to plastic. "There is a wonderful satisfaction to be got from turning out a really good article," he said, adding "foundry life has everything to offer a young man."

Foundry Trophy

Sir Frederick Scopes, chairman of the National Foundry College, Wolverhampton, offered at the annual dinner of the Walsall Foundry Trade Joint Recruitment and Training Committee in April last year, a trophy for competition amongst foundry apprentices.

The Walsall Training Committee has now decided that the trophy shall be awarded to the outstanding fifth-year apprentice who will be judged on his all-round practical and academic ability by a special awards committee. The form of the trophy has yet to be decided, but it will be held each year by the employer of the current Sir Frederick Scopes apprentice and the winner himself will receive a permanent replica. In offering the new award, Sir Frederick, who is also chairman of the Stanton Ironworks Company, Limited, near Nottingham, and of Chamberlin & Hill, Limited, Walsall, stressed the need for better training in the foundry industry and hoped that the incentive of a prize might be a practical step towards it.

Rubery Owen's French Agreement

Mr. Peter Spear, director of research, Rubery, Owen & Company, Limited, and Mr. R. D. Mills, manager of their foundry equipment division, recently flew to Paris to sign an agreement with a French manufacturer, Société Parisienne de Matérial et Equipment, giving them selling rights for the Hallsworth automatic moulding system in France and French territories. The French company, whose trade name is Sopame, are among the country's leading foundry-equipment manufacturers specializing in complete foundry installations, including melting plant. Mr. R. Germain, their managing director, expects this British-designed automatic unit will make a considerable impact on the section of French industry engaged in the manufacture of small ferrous and non-ferrous castings. Rubery-Owen have licensed Sopame to manufacture certain parts of the equipment, but will supply the moulding machine itself from this country.

Mr. M. S. GASKILL, technical director, West's Gas Improvement Company, Limited, and Mr. S. J. F. BEALE, managing director, Derbyshire Silica Firebrick, Limited, have been appointed directors of WGI, retaining also their previous positions.

British Blast Furnaces in the Third Quarter, 1960—*continued*

Staffordshire, Shropshire, Worcestershire, and Warwickshire.

Name of firm.	In blast at end of third quarter, 1960.					Weekly average in blast.	Total existing at end of quarter.
	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.		
Goldendale Iron	—	—	1	—	1	1	2
Shelton Iron & Steel	—	3	—	—	3	3	3
Stewarts and Lloyds: Bilston	—	1	—	—	1	1	2
TOTAL	—	4	1	—	5	5	7
Sheffield.							
Park Gate Iron & Steel	—	2	—	—	2	2	2
GRAND TOTAL	8	62	13	4	87	85·1	112

Weekly Average Number of Furnaces in Blast during the September Quarter, 1960, and the Previous Four Quarters

District.	1959.		1960.		
	Sept.	Dec.	March.	June.	Sept.
Derby, Leics., Notts., Northants, and Essex	17.7	17.6	18·8	20.6	20.3
Lancs. (excl. N.-W. Coast), Denbigh, Flint, and Cheshire	5.8	4.7	6.5	6.4	6.9
Lincolnshire	8	8.5	10	8.4	9.3
North-East Coast	15.6	16.1	16·4	17	17.6
Scotland	5	5.8	5·9	6.9	7
Staffs., Shrops., Worcs., and Warwicks.	4	4.6	4·6	4.5	5
South Wales and Monmouth	9.6	11	11	11	10
Sheffield	2	2	2	2	2
North-West Coast	6.6	7.4	8	8	7
TOTAL	74.3	77.7	83·2	84.8	85.1

The following companies have furnaces in course of construction or rebuilding:—J. Lysaght's Scunthorpe Works; South Durham Steel & Iron Company, West Hartlepool Works.

SDCE Achievement Award

The first award to be given by the Society of Die Casting Engineers (America) for outstanding achievement in the field of die-casting was presented recently to Mr. J. G. Rayniak, vice-chairman and director of manufacturing research for the Outboard Marine Corporation of Waukegan, Illinois. The SDCE Award is presented to an individual "for outstanding achievement in stimulating broad usage of die-cast products, in creative application of scientific principles to the die-castings process, in accomplishment in new product design, in development of new process techniques and in fostering educational programmes."

In his talk entitled "How Die-casting built an Industry," given at a banquet sponsored in conjunction with the First National Die Casting Exposition and Congress, Mr. Rayniak said his company in 1959 sold more than $170,000,000 worth of outboard motors, chain-saws, power lawn-mowers and related items. The cost per horsepower price of one of the company's products in 1960 was less than it was in 1941. Much of this reduction in cost, he explained, was due to extensive applications of the die-casting process. The aluminium V-4 cylinder engine-blocks for the new Evinrude and Johnson outboard-motors were produced on a 1,500-ton pressure-die-casting machine in the Johnson plant and this, he added, was one of the most significant advances in outboard power in the past ten years.

HARPER ENGINEERING & ELECTRONICS, LIMITED—Mr. H. C. Deeprose has resigned from the board.

Personal

Mr. IAN V. HENDERSON, B.A., M.A., B.SC., senior lecturer at Gateshead-on-Tyne Technical College, has been appointed principal of Inverness Technical College, which was officially opened by Lord Craigton, Minister of State for Scotland, last month. He succeeds Mr. VERNON CHAPMAN, of Bradford, who was appointed to the post in January but resigned shortly before the official opening.

Sir LEONARD SINCLAIR has accepted an invitation to join the board of Pirelli, Limited. Sir Leonard, who is 65, is chairman of the Valor Company, Limited, chairman of Fleming & British American Optical Industries, Limited, and a director of the Eagle Star Insurance Company, Limited, and the Ship Mortgage Finance Company, Limited. He is a former chairman of Esso Petroleum Company, Limited.

Mr. HARRY DOUGLASS, general secretary of the Iron and Steel Trades Confederation, has been nominated as deputy chairman of the British Productivity Council for 1961. The chairman-elect is Sir BERTRAM WARING, chairman and managing director of Joseph Lucas (Industries), Limited, who succeeds Mr. W. J. CARRON, president of the Amalgamated Engineering Union, as chairman of the BPC in January.

Peco Machinery Sales (Westminster), Limited, announce that with effect from January 1, 1961: Mr. J. BRUCE becomes home sales manager; Mr. G. T. BYAST, technical sales manager, and Mr. R. E. HARDY, export sales manager. On reaching retirement age Mr. L. W. LEES relinquishes his appointment of assistant sales manager, but in view of his knowledge of the trade will remain in the company's service.

Mr. C. LORD, chairman, Lancashire Tar Distillers, Limited, has been appointed president of the British Tar Confederation and chairman of the executive board for 1960-61. Mr. W. K. HUTCHISON, deputy chairman of the Gas Council, and Mr. C. M. FIRTH, of the South Yorkshire Chemical Works, Limited, have been elected vice-chairmen of the executive board. Mr. L. W. BLUNDELL has been appointed honorary treasurer.

Mr. JAS. S. CHRISTIE has been appointed deputy chairman of Scotcros, Limited, and of Mechans, Limited. He has resigned as joint managing director of Horseley Bridge and Thomas Piggott, Limited, but will remain on the board as finance director. He has also resigned from the board of its subsidiary, Carter-Horseley (Engineers), Limited. Mr. V. SENIOR will remain as sole managing director of Horseley Bridge and Thomas Piggott.

Sir GORDON RADLEY has been elected a director of English Electric Company, Limited. Sir Gordon joined the boards, last July, of Marconi's Wireless Telegraph Company, Limited, Marconi Instruments, Limited, English Electric Valve Company, Limited, and Marconi International Marine Communication Company, Limited, all members of the English Electric group. He retired as Director-General of the General Post Office last May.

Mr. P. HOESLI has resigned from British Non-Ferrous Metals Research Association, where he was liaison officer, to take up on January 2, a position as corrosion and metallurgical engineer at the head office of Shell Chemical Company, Limited, in London. Previously Mr. Hoesli was with Light Production, Limited, of Slough. He is a past-secretary and past-president of the Slough section of the London branch of the Institute of British Foundrymen.

Mr. J. P. E. JOHNSON has been appointed managing director, and Mr. A. D. GATENBY has been appointed deputy managing director, of Fleetway Manufacturing Company, Limited, a member of the Qualcast group of companies. Mr. Johnson who joined the company in 1941, became a director in 1945 and has been general manager for the past five years. Mr. Gatenby joined the company 15 years ago and became a director of the associated companies in the group in 1952.

Crofts (Engineers), Limited, power transmission engineers, of Thornbury, Bradford, announce that, following recent alteration of the company's articles of association authorizing the appointment of sectional directors, four executives of the company have now been appointed with this category; they are: Mr. E. J. HOLDIN, home sales director; Mr. F. ROTHERAY, overseas sales director; Mr. H. W. CAMERON, London-area director, and Mr. A. SPENCER, commercial director.

Mr. F. R. ROBBINS and Mr. A. M. C. MURPHY have been appointed joint managing directors of Hall & Pickles, Limited, as from January 1. Mr. J. H. RUSSELL is relinquishing his position as managing director for health reasons. He will retain his seat on the board and also on the boards of the parent company, Hall Engineering (Holding), Limited, and Improved Metal Company, Limited, another subsidiary. Mr. E. W. B. DAVIS will become general sales director.

Mr. HERBERT E. HILL, chairman of Laycock Engineering, Limited, Millhouses, Sheffield, and of the Birfield Group, presented gold watches to 25 employees who had completed 25 years' service with the firm on December 7. Mr. Hill who has himself completed 25 years as chairman was also presented with a gold watch by Mr. Sidney Walker, vice-chairman of Laycock Engineering. During his chairmanship Mr. Hill has introduced many benefits, including the company's pension scheme and the employees' shareholder scheme.

Mr. RONALD BAXTER has been promoted to assembly manager for commercial heating and micro switch with Honeywell Controls, Limited. He joined the company in 1955 as a product engineer, and in May, 1959, transferred to the production department as foreman of the electrical and mechanical sub-assembly departments in Plant 1. Mr. DONALD R. F. MACDONALD has been appointed chief accountant, in place of Mr. JAMES MCNEILL who was recently promoted controller of the company. Mr. WILLIAM GARDINER has been appointed personnel officer with the company.

Mr. G. W. BONE, joint managing director of Ruston & Hornsby, Limited, engineers, of Lincoln and Grantham, resigns this appointment on December 31, when he becomes vice-chairman of the company. He will continue as managing director of the firm's associate company, Davey, Paxman & Company, Limited, of Colchester. Mr. V. R. PRENN, who has been joint managing director with Mr. Bone, will retire on December 31 next year, and will be succeeded by Mr. C. T. ALDERSON, assistant managing director, who is to become deputy managing director at the end of this month.

Mr. FREDERICK WILLIAM CLARK, M.B.E., who is in charge of the brickworks of Richard Thomas & Baldwins, Limited, at Crowle, Scunthorpe, and is a past-chairman of the East Midlands Brick Association, has been elected president of the Institute of Clay Technology. He succeeds Mr. A. MARSHALL, of Thos. Marshall & Company (Loxley), Limited, Sheffield. Mr. J. F. BOOTH, M.B.E., chairman of Hepworth Iron Company, Limited, Penistone, has been elected deputy president. In his early days, Mr. Booth was chairman of the Sheffield and district branch of the former National Association of Clayworks Managers.

Australian Foundry Industry

Addressing the annual meeting of the Institute of Australian Foundrymen (NSW division), Mr. W. Butterfield, director of the Department of Industrial Development, said that the latest figures available show that there is a total of 817 foundries in Australia, 373 ferrous and 444 non-ferrous, employing 7,801 and 9,404 persons respectively, concentrated for the most part in New South Wales and Victoria. These two States contained 81 per cent. of Australian foundries and foundry personnel.

Ferrous foundries in New South Wales employ 2,855 persons compared with 3,073 in Victoria, but the average size of a ferrous foundry in New South Wales is nearly two and a half times that of its Victorian counterpart.

There are 202 non-ferrous foundries in New South Wales compared with 153 in Victoria and these employ 4,634 and 3,430 persons respectively. The average size of non-ferrous foundries is, therefore, the same for each State. The degree of human skill required for foundry work is indicated by the relatively high ratio of salaries and wages to value of production, the figure for ferrous foundries being 67.18 per cent. and for non-ferrous foundries 59.02 per cent.

Mr. Butterfield then gave some interesting statistics. He said that from 1945 to 1952-53 the number of persons employed in ferrous foundries in Australia increased by approximately 22.5 per cent. compared with nearly 29 per cent. for non-ferrous foundries. However, taking an index of output as being 100 in 1952-53 it has been estimated that by 1964-65 ferrous foundries will have an index of output of 187 compared with 149 for non-ferrous foundries.

Speculating about the reasons for this, he said it was possibly due to the important link between the ferrous foundry and the manufacture of motor vehicles where the index of output is expected to rise from 100 in 1952-53 to approximately 190 in 1964-65.

He said that assuming that the number of persons employed in foundries remains in constant proportion to the general growth in manufacturing employment it is to be expected that by 1964-65 there will be more than 22,000 persons employed in foundries in Australia and this figure will rise to 28,000 in 1969-70.

Foundry Survey

More information is given about this subject in a "Survey of Manufacturing Activity in Australia," published by the Industries Division, Department of Trade, Canberra.

In this survey it is stated that demand increased strongly for iron and steel castings during the year to the end of March, 1960. In the March quarter of 1960, output of steel castings was about 10 per cent. above the level in the same quarter of 1959 and output of iron castings was between 10 per cent. and 15 per cent. higher.

Employment in the firms interviewed increased by about 5 per cent. in steel foundries and by nearly 10 per cent. in iron foundries between March, 1959, and March, 1960. The industry confidently expected the high March level of activity to continue in the following months.

Structure of the Industry

The majority of ferrous foundries specialize in the use of either iron or steel although there are a few establishments producing castings in both.

Steel castings, which are made in a wide range of carbon and alloy steels, supply parts for heavy-engineering works producing railway rolling-stock, earth-moving equipment, mining and crushing plant and general machinery for manufacturing industry.

Iron castings have a wide application for domestic appliances, hardware, motor-vehicle parts, public utilities, farm and general machinery and are made in both grey and alloy irons. Meehanite, spheroidal-graphite and malleable iron.

Excluding captive foundries, there are nearly 350 ferrous foundries throughout Australia, employing some 7,400 persons. The value of annual output in the industry is of the order of £A20,000,000. Ferrous castings are produced in all States of the Commonwealth, with New South Wales and Victoria accounting for about 75 per cent. of total employment.

Information obtained from 56 firms, representing all sections of the industry and over 50 per cent. of its work force, was used as a basis for the report.

Steel Castings

The level of production of steel castings in all States in the March quarter of 1960 was substantially higher than in the previous year. Almost without exception, firms interviewed reported rises in the value of output, varying from 10 per cent. to as much as 40 per cent. The average increase for firms interviewed is estimated to have been about 10 per cent., after adjusting for price changes and number of working days. Based on information obtained from the firms interviewed, the steel casting industry in all States except Western Australia, where firms could lift their output considerably, was operating at nearly 90 per cent. of installed capacity on shifts current in March, 1960. Orders from all sections of industry using steel castings contributed to this high rate of activity. Orders on hand in firms interviewed were about 30 per cent. higher at the end of March, 1960, than a year earlier and generally amounted to between two and three months' production.

Five of the firms interviewed reported exports totalling nearly £A200,000 for the year ended March 31, 1960. The continuation of receipt of export orders has enabled one Western Australian foundry to reopen after being closed for almost nine months due to lack of work. Other castings were exported as integral parts of machines or spares. No imports were recorded. Notwithstanding the reported high level of activity in the industry, competition remained keen. Manufacturers expected production to increase by an average of about 8 per cent. during the next few months.

Iron Castings

The level of output of iron castings was between 10 per cent. and 15 per cent. higher in the March quarter of 1960 than in the same period of 1959. The reported level of output varied widely among individual firms, the large firms in the survey showing the greatest increase.

With only one exception, firms reported a satisfactory level of orders on hand, which in most cases amounted to about two or three months' production. They were confident that they would continue operating at or above the March level. It is calculated that the iron-casting section of the ferrous foundries industry was operating at above 80 per cent. of its installed capacity on shifts current in March, 1960.

Imports of iron castings are mainly confined to pipes and tubes and fittings for pipes and tubes. Considerable exports of iron castings as parts of machines, vehicles, equipment, spares and fitting were made in 1958-59, and a number of firms are seeking actively to extend their business in this field.

Australian Foundry Industry

Stocks

Stocks of finished castings, other than some proprietary lines manufactured by a small number of foundries, are not carried in this industry.

Raw materials stocks had risen in accordance with companies' increased output rates and generally amounted to between two to three month's requirements at the time of the survey. Pig-iron, coke and scrap are the principal raw materials and, of these, pig-iron and coke are in adequate supply. Some foundries in New South Wales reported good-quality scrap iron to be in short supply in that State, and delays in the delivery of pig-iron at times caused concern. Imported materials such as electrodes, nickel, ferro-alloys, bentonite, etc., were readily available.

Costs and Prices

In this industry, where wage costs account for between 30 per cent. and 50 per cent. of total costs, wage increases have a considerable effect on production costs. The total effect of basic wage and margins increases during the year to March 31, 1960, was estimated by manufacturers to have added, on an average, about 10 per cent. to wage costs.

Prices for coke and pig-iron have shown only minor increases during the same period, but iron and steel scrap prices were reported to be up to 25 per cent. higher in some of the States. Many steel foundries secured Japanese electrodes at up to 50 per cent. lower prices.

On the whole, costs in steel foundries were reported to be up to 10 per cent. higher than in March, 1960, while in iron foundries the increase was smaller. Increased costs in this industry are generally passed on to customers without delay, and in the 12 months to March 31, 1960, increased costs were generally reflected in higher prices.

Steel foundries generally lifted their prices by between 5 per cent. and 10 per cent. and iron foundries by up to 10 per cent. The increases were more pronounced in New South Wales than in other States, where prices particularly of iron castings, were reported by many firms to be stable.

Employment

In March, 1960, employment in steel foundries was some 5 per cent. above the March, 1959, level, and in iron foundries was almost 10 per cent. higher. There was also an increase in the proportion of overtime worked in both sections of the industry. The increase in employment was most pronounced in South Australia, Queensland and New South Wales.

Manufacturers expected little change in employment in the next six months. A shortage of moulders is causing some concern and is encouraging manufacturers actively to pursue measures to increase efficiency and productivity.

Investment

Capital expenditure already in hand or planned by the firms interviewed in the year following March 31, 1960, amounted to over £A350,000, about equally divided between iron foundries and steel foundries. More than 50 per cent. of this will be spent by New South Wales firms to provide additional production facilities.

Acknowledgment is made to the Australian foundry journal "Castings" as the source of this information.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

825,152. Meigh Castings, Limited, Uckington Foundry, Cheltenham, and Stothert and Pitt, Limited, Lower Bristol Road, Bath.

Composite articles or components of shaft-like form. They have a steel core and cast thereon, a casing of aluminium bronze, the steel core having a cross-sectional area of between 50 and 75 per cent. of the total cross-sectional area of the article (excluding any external projections) (see also B.P. **749,249,** FOUNDRY TRADE JOURNAL, July 5, 1956).

825,187. Compagnie de Pont-à-Mousson, Place Camille Cavalier, Nancy, Meurthe-et-Moselle, France.

Spheroidal-graphite cast-iron ingot moulds for casting steel or other ferrous-alloy ingots.

825,189. R. W. Taccone, 28, Chautauqua Boulevard, Erie, Pennsylvania, USA.

Diaphragm for foundry moulding machines which can be replaced on the machine in a very short time. It is also an object of the invention to provide a new type of diaphragm support for this type of moulding machine.

825,449. Veb (K) Schweisswerk Halle, 100a Otto-Stompsstrasse, Halle (Salle), O.16, Germany.

A method of electric arc welding for the purpose of repairing and/or building up iron castings, such as case-hardened cast-iron rolls and trunnions.

825,454. Sintercast Corporation of America, 134, Woodworth Avenue, Yonkers, 2, New York, USA.

Method and means for the production of heat-resistant articles such as turbine blades, nozzle vanes and guides; valves and valve parts for jet engines. The method involves use of liquid-phase heating at an elevated temperature. While heating the liquid metal is in contact with zirconia containing at least one crystallographic modifier selected from the group calcia, magnesia, beryllia, strontia, baria or ceria, in sufficient quantity to maintain the zirconia at least 75 per cent. cubic.

825,468. Gelor, Bohler & Company, A.G., Elisabethstrasse 14, Vienna, Austria.

An improvement in the method of continuous casting; particularly of refractory metals.

825,827. Anson United, Limited, 14, Albion Street, Castleford, Yorks.

Coreblowing apparatus of the kind in which a resin and sand mixture is blown into a heated mould from a pressure vessel by means of compressed air through a suitable valve or valves into the core moulds. It is a feature of this invention that two heated core moulds are provided, capable of being filled alternately.

825,855. Sterling Aluminium Inc., 2925, North Market Street, St. Louis, Missouri, USA.

Protectors for packing ring-receiving groove walls of pistons made of aluminium and its alloys, or of magnesium and its alloys.

825,887. Rolls-Royce, Limited, Nightingale Road, Derby.

Improvements in the preparation of moulds and cores for use in metal casting by the lost-wax method. The inventors believe this Patent may find "important application where it is desired to cast metal of high-melting point, *e.g.* in the region of 1,000 deg. C. or more."

Book Reviews

Determination of the Mechanical and Technological Properties of Metal. By B. M. Gliner. Published by Pergamon Press, Limited, Headington Hill Hall, Oxford; price 50s. 10d. (post free).

Mechanical testing of metals has grown without the care of proper parents. Its foster parents, the metallurgist and the engineer, never saw eye to eye on the question how this subject should develop. To most metallurgists, mechanical testing is a means to an end, the end being understanding of behaviour of metals under stress; to most engineers, mechanical testing is an end in itself, the end being the application of metals in design. Metallurgists are concentrating more and more on the nature of atomic movements and following these by such tools as the electron microscope, engineers are meanwhile pulling test-bars weighing up to 3 cwt.

Mr. Gliner in this book gives an engineering approach to the field of mechanical testing. His book is an engineer's study of equipment and apparatus used in testing, what these are used for and how they should be used. The very near description of this book would be a mechanical testing manual. Following the example that "by pressing button B, money will be returned," Mr. Gliner is equally direct on page 63: "force a hardened steel ball with a diameter D into the test surface A under a known load P, fig. 38, the hardness of the test metal is then determined in terms of the ball imprint diameter d" he says—and it is really as straightforward as that for descriptions of tensile, compression, torsion, shear, bend and high temperature testing, all dealt with in the book. A neat presentation catches the eye and drawings are made with the best engineering skill (never somehow attained by metallurgists). A novel feature in the contents of the book is that section which deals with methods of investigating machinability, weldability and hardenability.

As a manual of mechanical testing this is a good book, but its main interest lies in its review of Russian techniques used in this field, for as a textbook in English it makes no new contribution to the subject. For that matter, it is a somewhat expensive publication in view of the non-letterpress setting used. In the end, the reviewer is left seriously wondering whether we are going a bit too far in translating so many Russian texts. There is a lot of charivari in Russia!

V. KONDIC.

Dead So Soon (a "Cloak and Dagger" mystery) by Richard Grayson. Published by Hammond, Hammond & Company, 87, Gower Street, London, W.C.1; price 12s. 6d. net.

This is the third book by Richard Grayson which has been sent to the JOURNAL office for review, and it can reasonably be assumed that this book also was submitted because part of the action of the story takes place in a foundry—using the word in the broad sense. During the course of this "whodunit," readers are taken (along with the private investigator) on a tour of the Huntingham Steelworks, where steel ingots are being stripped from their moulds, then along to the soaking pits, cogging mill and finishing mill. But let it not be thought that the steelworks plays a large part in the story, for the detective follows his leads from a second-rate strip-tease club, and from the garden of a luxurious house on the edge of a golf-course to the seamen's quarter in Amsterdam. During the course of the story, one of the suspects receives an anonymous letter, made up of words and letters which had been cut—*inter alia*—from pages of the *Iron & Coal Trades Review*. The reviewer has heard of many of the ultimate destinations of pages from technical journals (some complimentary, some not), but this is believed to be the first time such a bizarre twist has been given. The book is well written and the characters are well drawn and convincing. Its perusal can be recommended as a pleasant means of distraction from too-serious foundrywork.

New Catalogues

Protective Equipment. Among a number of leaflets recently issued by Siebe Gorman & Company, Limited, from Davis Road, Chessington, Surrey, are two (numbers CLO5 and CLO6) which deal with various models of sand-blast and shotblast helmets and welders' helmets and shields. Another one (No. CLO4) covers clothing for cold conditions and—woollen—clothing for hot environments. For this latter material it is claimed that it does not readily burn and thus gives moderate protection against hot particles, molten metal splashes, etc. For greater protection it is stated that clothing made from aluminium-coated materials can be supplied. The final leaflet (DUS/1) describes and illustrates the firm's mark VIII and V.H.E. models of respirator, the second of which is approved by H.M. Inspector of Factories under the Iron & Steel Foundries Regulations.

Conveyors. An interesting publication has been received from Rownson Conveyors, Limited, Maiden Lane, York Way, London, N.7—a member of the Baker Perkins Group. It is designated "an A to Z conveying service" and carries a series of pictures showing the application of this form of mechanical handling. Two pictures are included in the catalogue showing the use of Rownson conveyors in foundries, the first being a heavy-duty roller conveyor for moving moulding boxes from moulding to pouring, and the second is of a 42-ft. long natural-frequency vibratory conveyor used as a knockout conveyor. However, the most impressive picture is of an 86-ton escalator with 106 steps, each 20-ft. wide, made by the company for a film set.

Castable Wood. Plastics & Resins, Limited, 9 South Molton Street, London, W.1, have used a folder to detail the properties of Metolux quick-casting wood. The material consists of a special liquid resin and a wood powder which, when mixed, form a malleable paste suitable for running fillets and similar jobs. It takes 30 min. to set, but is then harder than wood, smooth and machinable with wood-cutting tools. It will adhere to almost any surface except rubber, and a bowl of this material is recommended for its mixing.

Sawing and Cutting-off Machines. From A. & S. Osmond, Limited, 13, Dowry Square, Bristol, 8, have been received two publications. No. 216 is confined to illustrating and describing a high-speed abrasive-wheel cutting-off machine, model 0/10, in which are incorporated ducts for dust extraction. The second publication is in the form of a six-page folder, page size about 7½ by 5¼ in., yet by good layout, no fewer than 26 machines have been illustrated and annotated.

Hopper-loading Unit. In publication No. CFT 554, Conveyancer Fork Trucks, Limited, Liverpool Road, Warrington, describe an elevating and tilting assembly, operated by an electro-hydraulic power unit. The unit is designed for use in single-storey buildings for the mechanical handling of materials which have to be raised and unloaded above floor level.

Company Meeting

Hale & Hale (Tipton)

STEPS TO MEET DIFFICULT CONDITIONS

The 24th annual general meeting of Hale and Hale (Tipton) Limited was held on December 21 at Dudley, MR. R. C. LEPPINGTON (the chairman) presiding.

The following is an extract from his circulated statement:—

Although this is our Golden Jubilee year, I have to report that trading has been difficult, for despite a steady increase in business during the early part of the year, we suffered from selling prices which were too low, but these, I am pleased to say, have now been adjusted. The order book is quite healthy, and given fair trading conditions, the current year should produce improved results.

During the year under consideration we ceased production altogether from the open hearth furnaces, having completed the installation of the rotary furnace bay. Further, the new mechanized moulding plant has now been completed.

Your Directors considered it advisable to make these changes in the shortest possible time, but production losses were inevitable during the changeover. The new plant only came into operation half-way through the trading year, during which period little benefit was felt. The new melting plant is now producing a first class material which is being absorbed by the extended mechanised plant.

The benefit of this capital expenditure is beginning to accrue at an increasing rate.

Our customers are drawn from all branches of the engineering industry; we do substantial business with the motor trade, but the major portion of this is concerned with castings for the heavy commercial vehicle industry, and very little with the private car trade.

New outlets for our products are always being pursued and prospects generally are very promising.

Subsidiaries

Unfortunately, the Subsidiary Companies have had a bad year, with the exception of Hale Enamellers Limited, which Company has done well, and at present is in a favourable position both as regards production and order book; J. & J. Whitehouse (Tipton) Limited has also continued to make a useful profit.

As regards Chatwins Limited, this Company's position has been most disappointing, the result regrettably only underlining what I had to say last year regarding the shrinking demand for solid fuel appliances. However, steps are already in hand which I hope will strengthen this Company's trading.

Turning to J. Wakefield & Sons, Limited, as you know from press reports, the unfortunate publicity given to Oil Heaters generally closed up completely any sales of these products from last December, with the consequence that this subsidiary made a loss for the year. Sales of its convector heaters have, I am pleased to say, recommenced, but not to any large extent. These products now carry the official "Kite" mark showing that they have passed the very stringent test imposed by the British Standards Institute on all Oil Heaters being manufactured and sold in the United Kingdom. Arrangements are already well in hand to diversify this Company's activities in the future.

After reviewing the financial results for the year, the Chairman said:

It is customary to expect your Chairman to give some indication as to the expected results of future trading. I do this with some hesitation, as trading conditions generally can disturb my forecasts, but as far as the Holding Company is concerned, we look for an improvement in profit to accrue from the installation of the new plant now that more economic prices are being obtained from customers.

Special attention is being directed to the subsidiaries with a view to diversification and increased efficiency as we must expect a contribution from the subsidiaries to the profits of the Group.

You may be assured that vigorous efforts are being made to produce a better result next year, more in keeping with the underlying strength and reputation of your Company.

The report was adopted and the total dividend of 20% approved.

Company News

CLEVELAND BRIDGE & ENGINEERING COMPANY, LIMITED—Net profit for the year ended September 30, 1960, was £119,813 (£51,248), after tax of £23,000 (£16,000). Final dividend maintained at 5 per cent. makes 6½ per cent. and a 3 per cent. bonus is to be paid.

AVELING-BARFORD, LIMITED, power-driven plant manufacturers, of Grantham (Lincs)—The dividend is raised to 20 (12½) per cent. for the year ended September 30, 1960. Group profits expanded to £728,333 (£489,937), and the net profit is up from £203,848 to £370,631.

UNIVERSAL GRINDING WHEEL COMPANY, LIMITED—Group profit, before tax, rose from £852,585 for 1958-59 to £1,240,021 for the 53 weeks to October 1, 1960. The dividend is effectively increased by 5 per cent. to 20 per cent., tax free, as forecast, with a second interim, in lieu of final, of 12½ per cent.

GUEST, KEEN & NETTLEFOLDS, LIMITED—Of the 6,582,011 ordinary shares offered to stockholders at 70s. a share, about 97 per cent. have been taken up. The remaining shares have been sold for the benefit of those holders to whom they were provisionally allotted. The one-for-six issue was to raise £22,600,000.

CRABTREE ELECTRICAL INDUSTRIES, LIMITED—Sales during the year ended July 31, 1960, reached a record level. Net profit before tax was £45,535—16 per cent. higher than 1959—but, says Mr. J. A. Crabtree, the chairman, "it is disappointing that as a result of all the strenuous efforts made during the year, taxation negatives the result and the net profit after taxation shows a slight reduction."

DAVID BROWN CORPORATION, LIMITED—Highest profit since 1955 was made in the year ended June 30, 1960, but only by careful control of overheads and an 11 per cent. increase in throughputs, states Mr. David Brown, chairman. Investment in plant, with the increasing order volume preventing safe reduction of inventories, and the "vicious" slice of earnings taken by the Inland Revenue, have made it impossible to improve the liquid position further, Mr. Brown says. As in previous years no ordinary dividend is recommended.

Mr. J. W. GARDOM, of John Gardom & Company, and Mr. J. D. Hill, the firm's chief metallurgist, are flying to India on January 2 in connection with iron, steel and malleable foundry projects in the subcontinent. They expect to be there for several weeks.

ABERDEEN FOR ANGUS

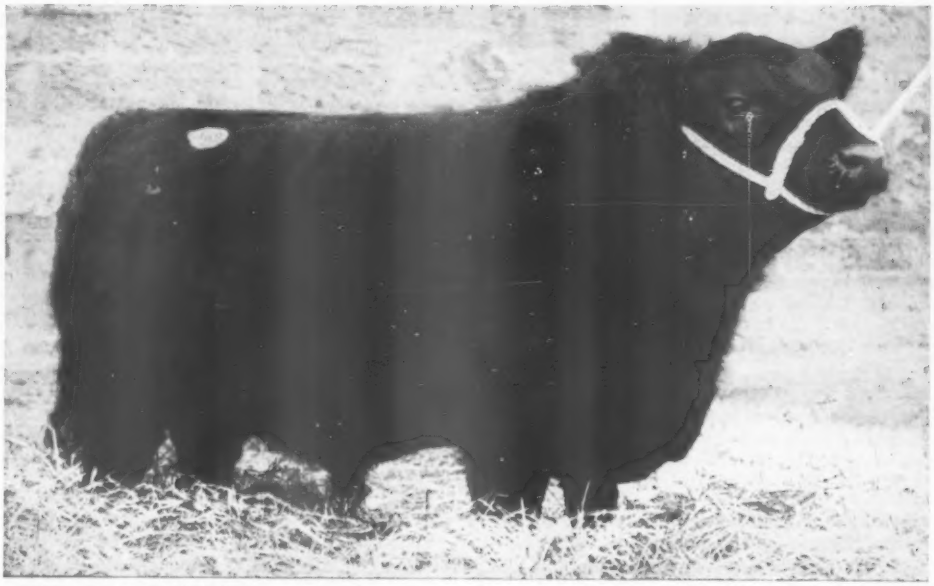


PHOTO: THE SCOTTISH FARMER

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Basis prices, delivered unless otherwise stated)

December 21, 1960

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over: Middlesbrough, £21 17s. 0d.; Birmingham, £21 9s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P 10-ton lots or over, £23 5s. 0d., delivered Birmingham, £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si less than 2 per cent, S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over; N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s. 0d.; Birmingham, £25 13s. 0d.; Wales (Welsh iron), £23 19s. 0d.

Basic Pig-Iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(per ton unless otherwise stated, delivered)

Ferro-Silicon (6-ton lots and over).—45 per cent. Si, £43 10s. 0d. to £46 0s. 0d., scale 15s. 0d. per unit, lumpy. 75 per cent. Si, £60 0s. 0d. to £63 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 20s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 11s. 8d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 14s. 8d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £81 10s. 0d. to £84 10s. 0d., basis 60 per cent. Cr scale 27s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £79 0s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale, 27s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 11d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £275 0s. 0d.; 96/98 per cent., £285 0s. 0d.

Ferro-columbium.—65/67 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £61 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 100 tons & over, £32 5s. 6d.; hard (0.41 to 0.60 per cent. C), 50 tons and over, £33 17s. 0d.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting, 50 tons and over, £35 4s. 6d. SIEMENS MARTIN ACID (50 tons and over): Up to 0.25 per cent. C, £40 11s. 0d.; silico-manganese, £43 4s. 0d.

Billets, Blooms, and Slabs for Forging and for Stamping (50 tons and over).—BASIC: Soft, up to 0.33 per cent. C, £37 0s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £38 2s. 6d.; acid, up to 0.25 per cent. C, £41 14s. 0d.

* Average 68-70 per cent.

FINISHED STEEL

Heavy Plates and Sections (50 tons and over).—Ship plate (N.-E. Coast), £40 7s. 0d.; boiler plates (N.-E. Coast), £42 17s. 0d.; floor plates (N.-E. Coast), £41 16s. 0d.; angles (N.-E. Coast), £38 1s. 6d.; joists (N.-E. Coast), £37 17s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 6d.; under 4 tons to 2 tons, £41 3s. 6d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £68 5s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £66 7s. 0d.; nickel-chrome, £97 1s. 0d.; nickel-chrome-molybdenum, £109 14s. 0d., in lots of 25 tons and over.

NON-FERROUS METALS

Copper.—Cash, £228 5s. 0d. to £228 10s. 0d.; three months, £226 0s. 0d. to £226 10s. 0d.; settlement, £228 10s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 2⅝d. per lb.; rods, 246s. 6d. per cwt. basis; 20 s.w.g., 281s. 6d. per cwt.

Tin.—Cash, £789 0s. 0d. to £789 10s. 0d.; three months, £788 10s. 0d. to £789 0s. 0d.; settlement, £789 10s. 0d.

Lead (Refined Pig).—Second half December, £63 15s. 0d. to £64 0s. 0d.; second half March, £64 17s. 6d. to £65 0s. 0d.

Zinc.—Second half December, £78 0s. 0d. to £78 5s. 0d.; second half March, £78 15s. 0d. to £87 17s. 6d.

Zinc Sheets, etc.—Sheets, 15g., and thicker, all English destinations, £120 15s. 0d.; rolled zinc (boiler plates), all English destinations, £118 10s. 0d.; zinc oxide (Red Seal) d/d buyers' premises, £100 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 10d. per lb.; sheets to 10 w.g., 197s. 9d. per cwt.; wire, 2s. 8¾d.; rolled metal, 197s. 9d. per cwt.

Brass (Brazing).—BS1400, B3, £173; B6, £222.

Brass (High Tensile).—BS1400, HTB1, £194; HTB2 £214; HTB3, £230.

Gunmetal.—BS1400, LG2, £215; LG3, £225; G1, 1%, £289; G1, 1%, £279.

Phosphor Bronze.—BS1400, PB1 (AID released), £306; BS1400, 90/10/1, £294.

Leaded Phosphor Bronze.—BS1400, LPB1, £237.

Phosphor Bronze Strip, etc.—Strip, 289s. 9d. per cwt.; wire, 4s. 0¼d. per lb.; rods, 3s. 3¾d.; tubes, 3s. 3¾d.; chill cast bars, solids 3s. 3¼d.; cored 3s. 4¼d. (CHARLES CLIFFORD LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10¼d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 3½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 2¼d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2½d. to 2s. 3d. per lb.; Antimony, English, 99 per cent., £200 0s. 0d. Quicksilver, ex-warehouse, £69 to £69 10s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £244; AB2, £251.

Translation Service

From amongst the most recently published lists of translations available from the Iron & Steel Institute (4, Grosvenor Gardens, London, S.W.1), the following have been selected as being of interest to founders. The price quoted is that for single copies, postage extra, there being reductions for quantities ordered. Readers writing for translations, or for further information, should mention this JOURNAL when doing so.

BISI 1736 APPLICATION OF VIBRATION PROCESS IN PRODUCTION OF CAST STEEL. Romanov, A. A. From a German trans. of the brochure "Cast Steel in Vibrating Moulds," Oct., 1959, Nat. Scientific & Tech. Publications for Mechanical Engineering Literature, Sverdlovsk. (£4 10s.)

BISI 1905 ATTACK OF IRON-SATURATED ZINC MELTS UPON CHROMIUM- AND NICKEL-CONTAINING IRON. Horstmann, D. *Arch. Eisenhüt.*, 1960, July, pp. 405-410. (£3 10s.) Investigations on the time and temperature dependence of the attack of zinc on iron containing up to 11.6 per cent. Cr and 10.5 per cent. Ni. Structure and growth of the iron-zinc-alloy layers.

BISI 1937 IMPROVING THE LIFE OF HARDENED-STEEL ROLLS BY ADDITIONAL TEMPERING. Funke, P. jun. *Stahl u. Eisen*, 1960, Sept. 29, pp. 1347-1348. (£1 5s.)

Translations in course of preparation include:—

BISI 1961 IMPROVEMENTS IN THE PHOTOMETRIC DETERMINATION OF SILICON. Konecny, Z. *Hutn. Listy* (Prague), 1959, (10), pp. 903-904.

BISI 1963 EVALUATION OF QUESTIONNAIRE DATA ON THE LIFE OF ROLLS IN SPECIAL-STEEL ROLLING MILLS. Wilhelm, E. *Stahl u. Eisen*, 1960, Sept. 1, pp. 1207-1211.

Other Translations

The initials OTS etc. stand for the organization to which enquiries for the following translations should be made, quoting the reference numbers. Addresses are given at the end of the list. In this case, enquiries should *not* be addressed to BISITS.

OTS 60-21913 USSR LITERATURE ON AIR-POLLUTION AND RELATED OCCUPATIONAL DISEASES, *vol.* 4. A SURVEY. Anon. 1960, Aug., 289 pp. ($4.00.)

UK AEA (Risley) IGRL-T/C-95 INFLUENCE OF CHEMICAL COMPOSITION AND STRUCTURE ON THE HYDROGEN CONTENT OF IRON AND STEEL. PART I. INFLUENCE OF SILICON, CARBON AND STRUCTURE ON THE BEHAVIOUR OF HYDROGEN IN UNALLOYED STEELS. Erdmann-Jesnitzer, F., and Sabath, H. *Arch. Eisenhüt*, 1957, *28*, pp. 345-53.

DSIR M. 1778 MECHANISM OF DESULPHURIZATION OF PIG-IRON. Korkuya, I. L. et al. *Dokl. AN SSSR* 1955, *101*, pp. 1065-1067.

BTC 124 AUTOMATIC COUPLINGS. Lasson. *Rev. Générale des Chemins de Fer.* 1960, Jan., pp. 42-47 (in prep. Oct. 1960).

LC SLA 60-19149 CRACK FORMATION IN THE HEAT-TREATMENT OF STEEL. Malinkina, E. I. Obra. Treshchin. pri Term. Obra. Stali, Moscow, 1958. (mi. $9.60, ph. $33.30.)

LC SLA AEC tr-4080 INSPECTION OF STRUCTURE AND MECHANICAL PROPERTIES OF STEEL PRODUCTS BY MAGNETIC ANALYSIS. Mikheyev, M. N. *Akad. Nauk SSSR. Inst. Fiz. Metallov (Sverdlovsk) Trudy*, 1958. No. 20, pp. 163-168. (mi. $1.80, ph. $1.80.)

LC SLA 59-19346 NEW METHOD FOR RAPID DETERMINATION BY SPECTROGRAPHIC ANALYSIS, Okada, T., Nakai, S., and Kohzuma, T. *Bunseki Kagaku* (Japan), 1956, vol. 5, No. 4, pp. 203-205. (mi. $2.40, ph. $3.30.)

EXPERIENCES WITH A RADIATION-CONVECTION RECUPERATOR FOR HOT-BLAST CUPOLA FURNACES. Polak J. *Slevarenstvi*, (Czechoslovakia), 1960, vol. 8, (7), July, pp. 230-236. Abridged translation in: *Engineers' Digest*, 1960, vol. 21, (10), Oct. pp. 89-90.

DSIR M 1701 STANDARDIZATION AND CLASSIFICATION OF PRECISION ALLOYS. Smolyarenko, D. A. and A. S. Kaplan. *Standardization*, 1959, (3), pp. 13-18.

OTS: Office of Technical Services, Department of Commerce, Washington 25, D.C., USA. DSIR: Department of Scientific and Industrial Research, 20, Chester Terrace, London, N.W.1. UK AEA: UK AEA Development & Engineering Group, Risley, Warrington, Lancs. BTC: The Library, Research Department, British Transport Commission (British Railways Division), London Road, Derby. LC: Photoduplication Service, Library of Congress, Washington, 25, D.C., USA. SLA: SLA Translation Centre, John Crear Library, 86, East Randolph Street, New York 10, N.Y., U.S.A.

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News in Brief

FOLLOWING THE SUCCESS of its first conference in May 1959, the Institute of Materials Handling is organizing a second International Conference to take place in Southport from May 10 to 12.

THE AMERICAN WELDING SOCIETY announces that practically 90 per cent. of all available space has been sold for its Annual Welding Exposition, which is to be held from April 18 to 20, 1961, in the Coliseum, New York.

Mr. L. CHAPMAN, chairman of Jessop-Saville Company, Limited, Sheffield, presented long-service certificates to four employees with 40 years' service at the firm's 25-Years' Service Association dinner this month. Mr. Robert Wallace, managing director, presented engraved watches to 34 employees with 25 years' service.

FURTHER EXPANSION is planned by John Holroyd & Company, Limited, the Milnrow (Lancs) machine-tool makers and gear specialists, when the present Milnrow extensions are completed next spring. A general expansion of the foundry and machine-shop at the Holfos works, Rope Street, Rochdale, is to be undertaken.

LIEUT.-COLONEL R. B. LEECH, chairman of Leeds Fireclay, Company, Limited, has informed shareholders that the board is discussing with an "American Corporation of international repute" the association of Leeds Fireclay with the American group in the manufacture in the United Kingdom of a highly-specialized type of refractory.

Mr. TOM FIRTH, chairman, Brightside Engineering Holdings, Limited, Sheffield, and Mrs. Firth, welcomed 450 guests at the firm's staff dance at the Cutlers' Hall, Sheffield, on December 14. (Mr. Ambrose Firth, until recently chairman of the firm, was to have been the guest of honour, but was unable to be present through indisposition.)

DAVIS & TIMMINS, LIMITED, manufacturers and stockists, screw machine products and press work, have established a depot on the Bridgend Trading Estate for the purpose of serving the industrial needs of South Wales. A dinner commemorating the establishment of the depot, held at the Royal Hotel, Cardiff, was attended by some 60 prominent industrialists.

THE FIRST STAGE of work at the new Mbizo township for Africans, on the outskirts of the Southern Rhodesian foundry centre of Que Que, was completed in time for the first families to move into the initial 70 married quarters before Christmas. It is expected that the village will be fully occupied by 2,000 Africans, including wives and families, by April, 1961.

ABRAFACT, LIMITED, grinding-wheel manufacturers, Sheffield and Gainsborough, are making 60-in. dia. wheels for the grinding of saw blanks to fulfil an order from Australia. The firm has never before made such large wheels in its 30 years' existence, and they may be the largest-diameter grinding wheels ever made in this country. A number have been completed. Each costs over £250.

DAVY-ASHMORE, LIMITED, announce that their subsidiary, Davy and United Engineering Company, Limited, has received an order worth approximately £300,000 from the Broken Hill Proprietary Company, Limited, New South Wales, for the design and supply of two 200-ton basic-oxygen converter furnaces. The furnaces will be manufactured at the Stockton Works of Ashmore, Benson, Pease & Company, Limited.

SINCE the Sheffield University Development Fund was launched in the early part of the year, Sheffield industrialists have subscribed over £450,000 to the fund, it is reported by Mr. A. H. Connell, University treasurer. It is hoped that £500,000 mark will be passed when the final list is published early next year. Success of the fund will mean that work can be started on a new building project for the Metallurgy Department.

JAMES STOTT & COMPANY (ENGINEERS), LIMITED, Vernon Works,, Oldham, has amagalmated with Glover & Main, Limited, and combined their catering equipment manufacturing resources with R. and A. Main, Limited. The board of James Stott & Company is now Mr. P. D. M. Aird, chairman; Mr. V. Stott, managing director; Mr. J. Fisher, director and works manager; Mr. D. J. Cottam, director and sales manager; Mr. C. Warley, Mr. J. Wortley and Mr. J. M. Scott.

THE FIRTH CLEVELAND GROUP has formed a new company, Firth Cleveland Steels Incorporated, with offices at 230 Park Avenue, New York 17, New York, which will act as selling agents in the United States for all companies in the steels division of Firth Cleveland. Mr. Charles W. Hayward, chairman of Firth Cleveland, Limited, is president of the new company, and Mr. J. W. Tonking, managing director of Firth Cleveland Steel, Limited, is director and vice-president. The steels division of Firth Cleveland Incorporated, of which Mr. P. H. Garfunkel was general manager, has been merged with the new Corporation.

AN INTEGRATED West Australian iron and steel industry, involving the expenditure of £80,000,000 over an 18-year period, will be established at Kwinana under an agreement between the Government and Broken Hill Pty. Limited. Premier Brand, announcing this, said the project—which would create work for over 1,200 men—depended on a £35,000,000 standard-gauge rail link between Kwinana and Kalgoorie. The Bill, ratifying the agreement, passed all stages without amendments in the Legislative Assembly, and strengthens the State Government's moves for an early Commonwealth decision on the Kwinana-Kalgoorie railway line.

IN ADDITION to contracting into the Government's graduated pension scheme, which comes into force next April, Allied Ironfounders, Limited, has introduced life assurance cover for all employees over 18 not already covered by the group's staff pension scheme. The scheme became effective on December 1, 1960, and provides for the payment of £250 on the death of an employee from any cause whatsoever before the age of 65 in the case of men, or 60 in the case of women. Inclusion in the scheme is automatic, and lasts for as long as an employee remains on the payroll. The cost will be borne entirely by the company. The new scheme, which the promoters believe to be the first of its kind in the iron-founding industry, will cover more than 7,000 workers.

"THE PROFESSIONAL ENGINEER—HIS EMPLOYMENT AND DEVELOPMENT" is to be the theme of a one-day conference to be held by the Engineers' Guild in the Connaught Rooms, Great Queen Street, London, W.C.2, on March 22, 1961. Chairman of the Conference will be Sir Hugh Beaver, president of the Guild and speakers will include Viscount Chandos on "The Engineer in Society"; Mr. D. J. Mann (Unilever, Limited) on "The Engineer and the Technician"; and Mr. A. R. Cooper, of the Central Electricity Generating Board who will speak about the "Engineer in Management." The Conference is intended for managers, personnel officers and professional engineers, and copies of the programme can be obtained from the secretary of the Guild at 201, High Holborn, London, W.C.1.

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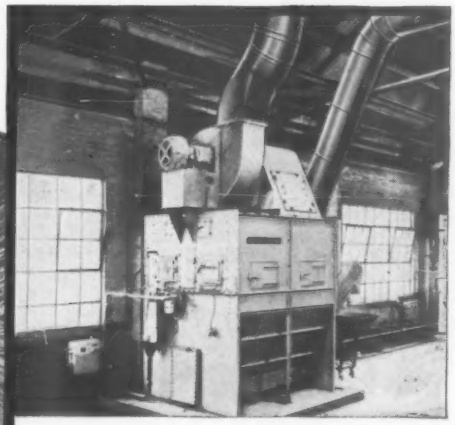

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Raw Material Markets

Iron and Steel

During the holiday the opportunity was taken of carrying out essential repairs to plant and cupolas. Stocks of raw materials on hand were generally adequate for resumption of production and no difficulty was experienced in obtaining prompt delivery of urgent requirements.

Many producers of castings, especially those supplying the motor industry, look to the New Year for an improvement in trading conditions. Those sections of the engineering foundries catering for many users of high duty castings continue to be reasonably well employed, but the light foundries producing castings for domestic utensils are hoping for better things in the coming months. The foundries supplying light castings to the building trades are more favourably employed, but they, together with many of the jobbing and textile foundries, could still undertake more work than they are getting at the moment.

All grades of pig-iron are in good supply, and as production at most of the blast furnaces continued during the holiday, tonnage has been put into stock thus providing additional supplies for the foundries now. The foundries are able to obtain most of their requirements of scrap, although arisings are scarce, particularly of special grades. Deliveries of foundry coke, ganister, limestone, and firebricks are satisfactory.

Work on hand at the re-rolling mills enabled them to resume production at good levels for most products, although some of these, including bright drawn bars and hot rolled strip, are not now so heavily in request. Heavy demands continue to be made for reinforcing rods. Most of the re-rollers have fairly good stocks of mild steel semis and home steelworks continue to send forward substantial tonnages. They are not so well provided with carbon and alloy steel billets, etc.

Non-ferrous Metals

Although the copper market is still supported by some bullish influences, particularly the fact that the market is still suffering from the last strike at Chuquicamata and there is every reason to believe that a stoppage of work will occur at another big Chilean mine, El Teniente, the market has been weak on both sides of the Atlantic. In London the weakness has been the result of a relaxation of the technical supply position, the fresh rise in stocks last week by 855 tons to 13,555 tons—the highest level for over a year—and, finally, the statistics for November released by the US Copper Institute which showed that stocks there had risen by 17,000 tons to over 130,000 tons.

The immediate market outlook will be directly influenced by end of year sentiment so that there is little chance of the market recovering its recent price losses. The longer term outlook is cloudy and unless and until demand improves on both sides of the Atlantic the prospect is for prices to continue to weaken. In the US 30 cents a pound is still the quotation applicable to custom smelters and producers although the metal is changing hands below this price.

Lead is a depressed market. The plight of the automobile industry has played its part in this situation but there is also the factor of shipments of metal from the Continent to this country overloading the market. In any event, the LME price is now at its lowest level for 14 years and there is nothing in the outlook to suggest a marked reversal of the present price trend. In the US demand is only moderate, stocks are high, and continue to mount so that it was not altogether surprising that the New York spot price has been reduced by one cent to 11 cents a pound.

Zinc is also in the doldrums. In the UK consumers are extremely reluctant to enter the market, knowing as they do that there is a heavy surplus available and that foreign metal will continue to arrive in this country and keep prices low. In the US the long awaited break in the price structure has now occurred and there have been two successive reductions in the price—each by ½ cent a pound—in the last two weeks which has brought the East St. Louis spot quotation down to 12 cents a pound. The outlook is cheerless and no doubt producers will have to initiate further cutbacks in production if prices are to be stabilized at anything around their present levels.

Tin has been a relatively steady market in London, although weak in the US where the price is now below $1.02 cents a pound. The outlook for this metal still looks good, as a shortfall in production is still expected during 1961. Last week tin stocks in LME warehouses gained 108 tons and now stand at 9,284 tons.

Obituary

Mr. JAMES GARSON, managing director in charge of tube production for Stewarts and Lloyds, Limited, has died at the age of 69.

Mr. E. G. TRANTER, a cashier at Browns Foundry, Limited, Nottingham Road, Derby, for over 50 years, has died at the age of 82.

The death has occurred at the age of 58 of Mr. W. G. AULD, a former company secretary of the North British Steel Foundry, Limited, Bathgate, West Lothian. He left the firm about nine years ago to start up his own business.

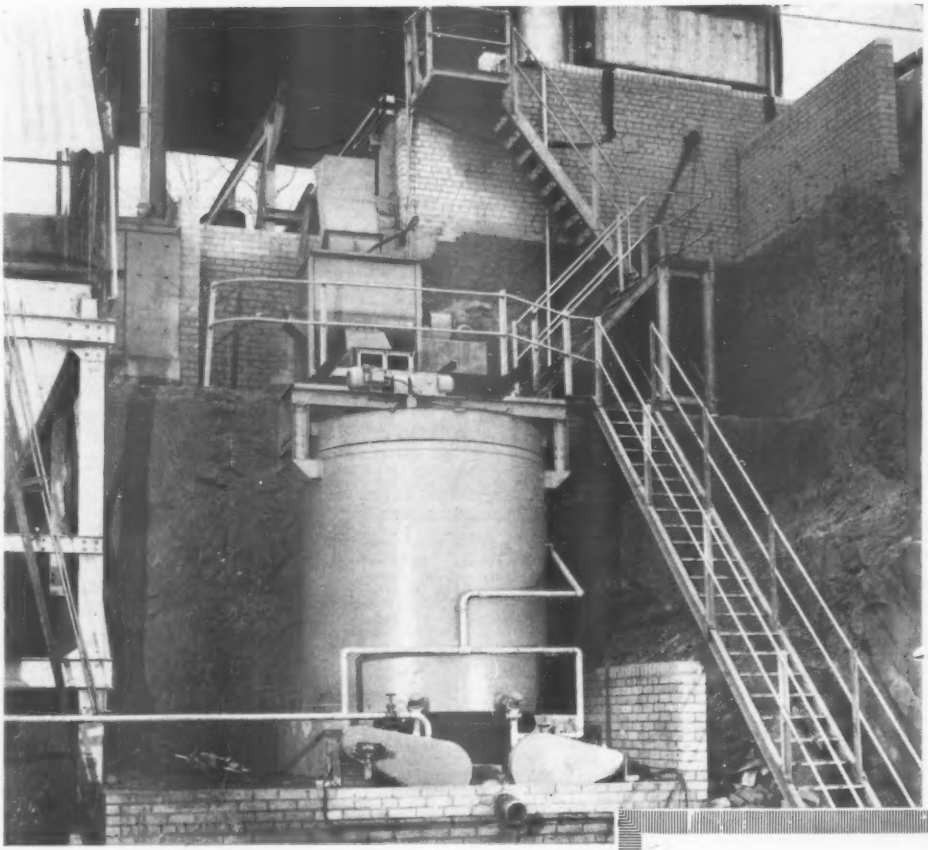
Mr. E. W. STARKEY, a former director of Charles H. PUGH, LIMITED, motor-mower manufacturers, Atco Works, Tillon Road, Birmingham 9, died on December 11 at the age of 83. He had served 59 years with the firm when he retired in 1955.

The death has occurred, at the age of 44, of Mr. FREDERICK BERTRAM MARTIN. Since leaving school he had been a member of the staff of the Lilleshall Company, Limited, structural engineers, of Oakengates (Salop), and last year was appointed merchanting manager of the subsidiary, the Fairmile Engineering Company, Limited.

Alderman JOHN CLARK, who worked for Rolls-Royce, Limited, Derby, for nearly 30 years and was a member of the Derby district AEU for many years, has died at the age of 88. He was a former Mayor of Derby, a member of the town Council for 40 years, and was admitted an honorary Freeman of the Borough five weeks before his death.

Mr. DAVID W. T. EVANS, development engineer of the Chesterfield Tube Company, Limited, has died from injuries he received in a road accident. He was 58. He had been associated with the Tube Investments, Limited, group for 24 years and he joined Chesterfield Tube, where he was in charge of the construction and development department, some 10 years ago.

Former secretary and director of the Chesterfield Tube Company, Limited, Mr. JOHN WILLIAM WINN SINDLE, has died at the age of 81. He joined the company, a member of the Tube Investments, Limited, group, from a firm of accountants and was appointed secretary in 1923 and a director in 1944. He retired 10 years ago, but continued in an advisory capacity.



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HISTORICAL NOTE

Mansfield Standard Sand Company has been supplying Foundries for one and a quarter centuries and is the sole producer of Mansfield Moulding Sand—known throughout these islands and the world over for its 'standard' quality.

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Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House, 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

CHIEF ENGINEER (40), A.M.I.PlantE., A.M.I.B.F., seeks new post. Good experience modern mechanised foundries and machine shops. Installation, maintenance, planning, development, malleable grey iron, steel. Salary £1,500—£2,000. Assistance with housing. Box CE946, FOUNDRY TRADE JOURNAL.

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NON-FERROUS FOUNDRY EXECUTIVE, A.M.I.B.F., seeks change, 20 years' experience aluminium gravity die-castings, good knowledge of CO_2 and shell coremaking. Birmingham area. Box NF515, FOUNDRY TRADE JOURNAL.

FOUNDRY METALLURGIST (City & Guilds), experienced iron and steel, CO_2 and shell-moulding. Radiographic inspection. Available January. Box FM521, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

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BOX AA506, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

AUSTRALIAN opportunity. TECHNICAL SALES ENGINEER required by leading manufacturers of foundry equipment after initial training period England to work permanently in Australia resident Adelaide area. Progressive position for ambitious man with plant sales and administrative experience. Write fullest details experience, salary, etc.. to Box No. 996, DORLAND (CITY), LIMITED, 28, Haymarket, London, S.W.1.

METALLURGIST (young qualified) required for Investment Casting Foundry in Midlands. Experience of steel investment casting essential. Good prospects and salary. Write, giving full details of age, qualifications, previous posts held, etc., to BOX MY507, FOUNDRY TRADE JOURNAL.

Advertisers whose announcements appear under a box number are urged to acknowledge, however briefly and informally, all replies received. This particularly applies to advertisements under "Situations Vacant"; serious inconvenience and, sometimes, real hardship can be caused to applicants who receive no indication even of the safe receipt of their communication. Failure to acknowledge replies can also reflect on the good faith of this journal, which is responsible for their onward transmission. If it is desired to maintain anonymity, an acknowledgement on plain paper, quoting the relevant box number, is all that is necessary.

SITUATIONS VACANT—*contd.*

APPLICATIONS are invited from persons with suitable experience or technical qualifications to be responsible for Quality Control activities in a Foundry producing steel and high alloy castings by the Lost Wax and Shell Moulding techniques. The successful applicant will be expected to exercise his ingenuity in developing new techniques and improved methods of manufacture. Applications with full details of education, qualifications and experience to be sent in confidence to the PERSONNEL MANAGER, HADFIELDS LTD., East Hecla Works, Vulcan Road, Sheffield, 9. This is a repeat advertisement. Applications received in response to the previous advertisement will receive further consideration.

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Personnel Officer

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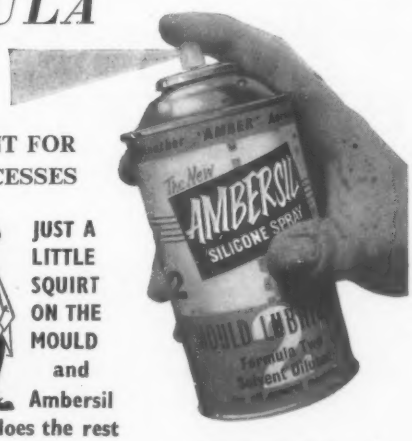

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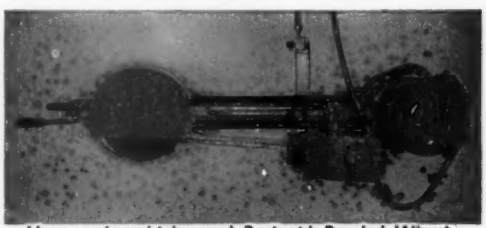

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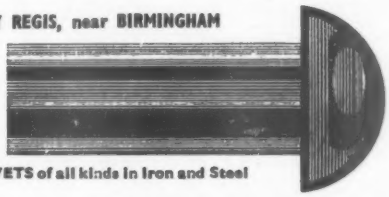

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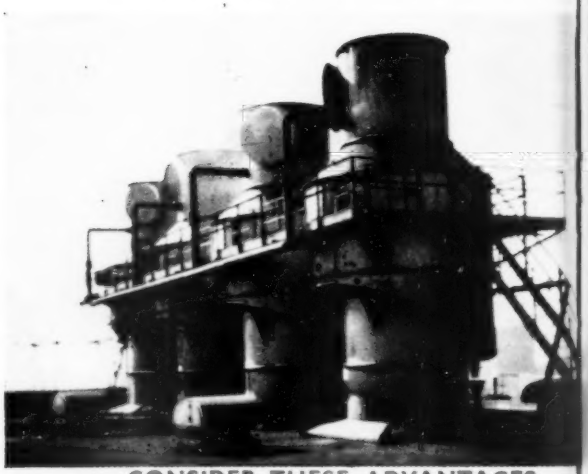

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